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COLONIAL AND INDIAN EXHIBITION.

INDIAN SILK CULTURE.

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With the author's
kind regards.

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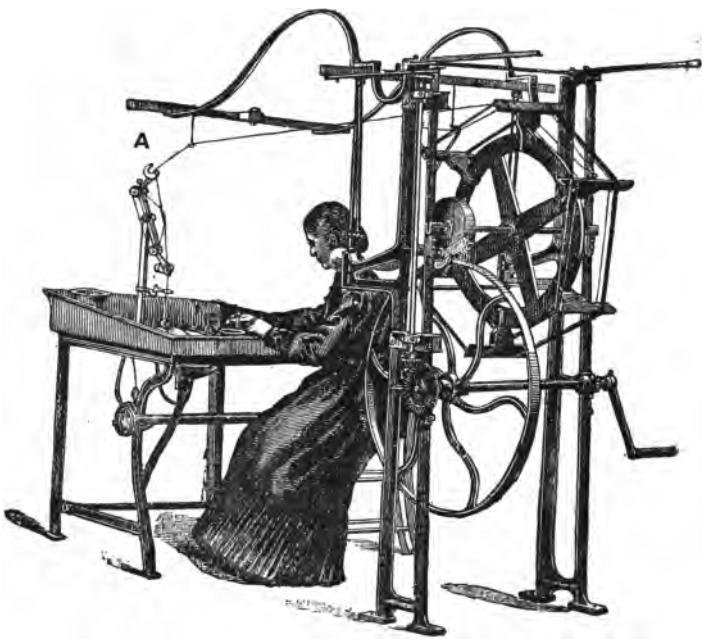
PLATE I.



European Cocoon-reeling machine, diagonal view.
(A. Tavelette Consono.)

[*Frontispiece.*

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London, Exg. (City)

COLONIAL AND INDIAN EXHIBITION.

ROYAL COMMISSION AND GOVERNMENT OF INDIA SILK CULTURE COURT.

DESCRIPTIVE CATALOGUE.

BY

THOMAS WARDLE, F.C.S., F.G.S.

HONORARY SUPERINTENDENT.

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INDIAN EMPIRE.

Executive Commissioner,
SIR PHILIP CUNLIFFE-OWEN, K.C.B., K.C.M.G., C.I.E.,
Secretary to the Royal Commission.

Commissioner for the Government of India,
SIR EDWARD C. BUCK, LL.D., B.C.S.

Official Agent for the Government of India,
J. R. ROYLE, ESQ., C.I.E., Assistant Secretary to the Royal Commission.

Special Officer in Charge of the Economic Court,
DR. GEORGE WATT, C.I.E., M.B., C.M.

Honorary Superintendent of the Royal Commission and Government of India Silk Culture Court,
THOMAS WARDLE, ESQ., F.C.S., F.G.S.
(Leek, Staffordshire.)

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INTRODUCTION.

BEING A PAPER ON THE SILKS IN THE INDIAN SILK CULTURE COURT AT THE COLONIAL AND INDIAN EXHIBITION, READ IN THE CONFERENCE ROOM ON THE 24TH OF JUNE, 1886.

THE Chair was taken at 8 o'clock by Mr. (now Sir) Edward C. Buck, LL.D., Secretary to the Government of India Revenue and Agricultural Department, who said: "I consented to preside to-night with the greatest pleasure, because I know, perhaps more than any man, the manner in which Mr. Wardle has devoted his time and labour and his funds towards promoting the cause of the revival of the silk industry in India. I hope the result may be as great as his labours deserve, but whatever improvement may result in the silk trade of India in consequence of his devotion, I am sure he will have the gratitude of both the administrators and the people of India.

We are met here to hear Mr. Wardle's paper, and discuss the influences which may have lead to the decline of the silk industry, and if possible to suggest some means of reviving it. From all I have been able to note, I believe that the silk trade of India has gone down because others have gone up owing to their ability to produce better silk, or as good silk for less money. If this be so, it is not surprising that the trade of India should have decreased, and the question now is whether we can make better silk by improving the silk-worm, or in the processes of reeling and weaving. I will not detain you by attempting to discuss this question, which will be better dealt with by Mr. Wardle and others who may follow him. I will only say that the climate of Bengal is inferior for the *Bombyx mori* worm to that of some other parts of India where experiments are now being made; I hope they will be successful, and in the meantime every effort ought to be made towards improving the existing industry of Bengal. Mr. Wardle's observations may lead us to hope that such may be the case."

PAPER.

"The object of this Imperial and Royal Commission Collection is to illustrate the Silk Industries of India in a two-fold sense. First, it proposed to show the exact state of Sericulture in India at the present moment, the position which it occupies in the output of the raw product, which may be stated to comprise everything that relates to the cocoon and to raw silk, which is a reeled thread of several cocoons in one. Second, its phase in India, as entirely apart from the breeding of the silk-worm, in the manufacture of the great variety of fabrics of which silk comprises, if not the whole, the most important part. These may be roughly stated to be the Corah silks of Bengal, rudely produced by looms that would raise the smile and wonder of Europeans, the coarse Tussur fabrics woven in the same and other districts, the magnificent kinkhabs of Benares, Ahmedabad and Surat, in which gold and silver form such important decorative features, the plainer silks of Delhi, the delicate and beautiful silks of Thana (a very ancient Christian Settlement), manufactured by a curious and isolated race of weavers, whose story as well as work is so interestingly told and so beautifully illustrated by Mr. Gupte, in his article on the silks of that place, in the Journal of Indian Art, No. 5. In the sixteenth century there were 4000 weavers at Thana, but now there are only seven families with fourteen looms. The rich fabrics of Yeola, situated not very far from Thana, the lovely brocades of Surat, incomparable for living beauty and Arabian grace of design, the ruder though not less interesting silks of Peshawar and the surrounding country, the satins of Azimgarh, Ahmedabad, Surat, Dhrangdhra and Kathiawar, the wonderfully constructed patterns of the Patolo weaving with 'tie and dye' warp and woof, the silks of Behrampur, Cambay, Cutch, Indore, Kathiawar and Bombay, all testify not only to the skill achieved by Indian dyers and weavers during many ages, but also for the fascinations which have held these people spell-bound in the production of their fabrics of mystery and beauty.

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"The printed silks of India, too, are by a long way not the least of her interesting decorative work. It is a great pity that anything should have superseded the permanent and striking prints of the old-fashioned pocket-handkerchiefs. I have seen them being printed on the squat tables of the Calcutta printers, with indescribable interest, who use their prettily sculptured little blocks with a dexterity and exactness marvellous to see, requiring no pin points to guide them in their repeats of patterns.

"The Indians, like the Chinese and Japanese, have never cared so much for what in Europe is termed excellence of quality, which means for the most part mechanical regularity in texture and pattern, and although they have had to weave with threads often much varying in regularity and thickness, yet they have down to to-day managed somehow or other, if they have had a pattern to weave, to put, so to speak, soul into it, and to raise it above the commonplace fabrics so often produced in modern Europe.

"For ages, and so long as they continued to use the natural colours which they obtained from their own beautiful dye-stuffs, coupled with an ingenious and traditional taste, they never could go very far wrong in colour. It is now impossible to observe without great regret in passing through India how the love of the modern brilliant European dyes has affected, to a serious degree, the products of the native loom of to-day.

"This is also to be observed as much in another part of silk decoration in India which is as extensive, if not more so, than weaving—viz., the ornamentation of fabrics of cotton, wool, and silk, by embroidering with a silken floss or thread. Embroidery in India is on a great scale, much of it unknown because unseen. The native ladies of Assam, for example, embroider most beautifully, not for sale, but for domestic uses and for marriage and other presents. It is purely carried on as an art, and not for commerce, and it is principally done with a silk that will one day, I feel sure, be in considerable demand in Europe—I mean the silk produced by the worm of the *Antheræa Assama*, or the Muga silk-worm. It was not known to the English until recently that any of this silk was exported. It has often been stated by observers in Assam and India, that it was only produced for home consumption, but when I was in Calcutta making inquiries about this silk, which has engaged my attention now for several years, Mr. E. C. Buck and Mr. H. Z. Darrah, Officiating Director, Department of Agriculture, Assam, discovered, whilst on a tour of inspection and search in the native bazaars of Calcutta, that the embroidered turbans made in Dacca were worked upon a cloth of cotton and Muga silk, wholly embroidered with undyed silk of the same kind. This embroidery, which had been very well known as having been sent down to Calcutta, and largely worn there by the natives, and also exported into Arabia and other parts of Western Asia, but kept, and still kept, in the hands of a very few merchants, was previously thought to be worked with Tussur silk, the fawn-like colour of which it closely resembled.

"The history of Silk is so well known that it does not require from me more than the most passing notice, merely that which is sufficient to show that whilst we are indebted to the sunny East for this industry, it surely travelled westward, although slowly, until we ourselves have long ceased to be the most westwardly country which has claimed a right to and shown a qualification for the possession of a share of working in this wonderful product of nature; it has followed our kinsmen across the Atlantic, until it almost joins hands with its mother country, which gave it birth in ages so remotely past; for, on first leaving China, it found its way through India, Persia, and Asia Minor to Europe; and in the sixth century it attracted the attention of Justinian, who soon after gave it its first and sure start at Constantinople. We find it afterwards localised in Greece for a long period before the twelfth century, when it was known and practised in Sicily. It reached Italy in the thirteenth century, from whence it spread into France and Spain. We are indebted to the Huguenot persecution for its establishment if not its introduction into England, where it has met with varying fortunes for the past 200 years. On the whole it was never so bad, and, as some think, never so unpromising as now.

"We can claim as much right, although not such an ancient one, to the manufacture of silk in England, as any other European country, but we may not say the same of silk growing or sericulture proper. James I. tried his hand at that, but he made the mistake of thinking more of the mulberry tree than of the natural history of the silk-worm, for it certainly was of no use to have silk-worms creeping out of their eggs in a climate where the mulberry leaves were not ready to feed them.

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"The silk-worm only thrives where the climate is more congenial than it is here. There is no hope or future for the production of cocoons in England, but there is a good hope of a good future for the retention, development and extension of the making of silk yarns and fabrics. Why not? England possesses a splendid silk manufacturing climate, more humid, or rather less dry, than perhaps any other country, good conditions for winding and weaving silk; brain power not less than other nations, and opportunities of study and technical training gradually although slowly developing. It has examples of ancient and modern art of the best, as well as the worst types; and these should give the best incentives to make beautiful work with either the needle or the loom, by lessons of guidance or avoidance.

"Why should we not resume our fair share in the production of all that silk is capable of in applied use and beauty? I am not one who takes a gloomy view of that which seems to some an impossibility or a hopeless effort. There is much, it cannot be denied, in the revival of this pursuit to attract those who wish to realise happiness of occupation and useful aims, although perhaps not to those who are in search of fortune above other considerations, or of speedy reward.

"My paper thus naturally divides itself into the two aspects of the question with which I started: Silk Manufacturing, which we too, in England, can share with our Indian fellow subjects, and Silk Growing, a field for India, in which we cannot hope to share, but which ought to occupy more of our care and countenance than it does.

"The happiness and prosperity of India is, or ought to be, involved in the happiness and prosperity of England, and contrariwise if Imperial Federation has any meaning, and because of our grave and Christian responsibilities there.

"How Lyons cherishes her Gard, Ardeche, Drome and Vaucluse departments, which send to her dyehouses and looms such carefully reared silk! How these silk-worm rearing districts endeavour, by the most careful attention to all the minutiæ of breeding and feeding, to furnish Lyons with silken fibre of such beautiful quality that the cultured taste gives a ready preference to fabrics produced under such conditions; and so with Italy in both ancient and modern days! I am here to ask, why shall it not be so with us, and the beautiful silk paradise of India committed to our charge and responsibility?

"We are, in our sericultural wealth, through having India, more than equal to France, Italy, or any other country in the world, being in some respects better off than even China; for we are not confined to one species of silk nor to two. India can boast of the greatest silk-producing fauna in the world. She has her varieties of Bombycidæ which feed on the mulberry leaf, both wild and domesticated; she has her jungle broods of worms of many sorts, more or less useful or to become useful by-and-bye; her Tussur silk is now an established and well-rooted industry, a few years ago in exports non-existing; her Assamese women are clad in silks of the Eri and Muga worms, of which as yet we know practically nothing; and silken stuffs are handed down from matron to spinster but little the worse for the wear of a generation. Of all these silks and some others I am here to speak to you; and having been sent out to India to learn of them on the spot, it must not surprise if I return much impressed with the necessity devolving upon us to cherish and develop her industries, so that we may have reason to know that our interests there are not wholly selfish, and that her immense and struggling populations may participate in our comforts and success.

"Too little regard has been paid in recent times to Indian raw silk. Its merits have been overlooked and almost forgotten in the incrustations of defects arising from not keeping pace with the more active thought of the West, and its continually developing appliances for amelioration and improvement of quality, as well as from other but minor causes.

"India sends to Europe but very little raw silk now. It was only 457,600 lbs. in 1885. In 1874 it was 2½ million lbs., and in 1870 2½ million lbs., against an annual export from China to Europe in 1883 of 7 million lbs., and from Japan of 3 million lbs. Just a hundred years ago, Indian silk was so good in quality as to drive out all competitors from the European market, save China and Italy. In 1884 it was so bad that European manufacturers could not buy it; it had gradually lost its reputation from want of quality. But the silk itself, that is, its fibre as it rested in the cocoon, had not altered in these hundred years; the method of manipulation, I mean the reeling of it from its cocoon, had not kept pace with that of other countries; it had in

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fact fallen back, gone worse, until Indian silk almost found no place in the world's market; and more, even the manufacturing people of India would not buy it. In a few of the Bengal districts, such as Murshidabad and others, it is used for weaving Corah silks, but generally over India it is not to be found. The manufacturers of Poona told me they bought China silk because Bengal silk was of such defective quality. From the Deccan to Calcutta, and from Calcutta to Benares, and on to Peshawar, I found either China or Bokhara silk; and so down Rajputana to Ahmedabad, Baroda, Surat, Yeola, and Thana, everywhere the native silk avoided, and everywhere the same reason given, its want of thread regularity.

"India only wants the application of progressive observation, and the immediate adoption of whatever method the progress of science and mechanical art bring to produce better results in Europe. That there is ample scope may be inferred from the fact that for the ten years ending 1883 we in England have been purchasing manufactured silks from countries in Europe to the extent of about £11,000,000 annually. I extract the following interesting statement from Mr. J. E. O'Conor's 'Review of the Trade of India in 1884–85':—

"'Silk was imported to a much smaller extent than in the last two previous years, only 1,831,702 lbs., which was 17 per cent. less than in 1883–84, though still a very large quantity for a country which is held to be a great silk-producing country. Whatever may be the capacity of the country for producing silk in large quantities, it is clear that while India imports more silk than it exports (the bulk of the exports being, moreover, only waste or chassam), the country must more properly be called an importer and consumer rather than a present producer of silk. Most of the imported silk comes from China and from Siam, *viâ* the Straits for Bombay mainly, and Burma in smaller degree. Even Bengal, however, the great silk-producing province, imported 212,349 lbs. of silk last year.'

"Having convinced myself, by lengthened microscopical study of the structure of Bengal and other cocoons, of the wonderful regularity in which the silk-worm deposits its silken thread, I felt that the fault did not lie with the worm, but in the earliest stage of manufacture, that of reeling or unwinding the silk from the cocoon.

"I have had many opportunities of observing silk-reeling in both France and Italy for many years past, and I felt that if the same care and appliances were used in India as in these countries, silk of proper quality could be obtained.

"In that I perfectly succeeded, and in no case in India was it told me that an improved thread was not the result, in every case it was admitted.

"The use of this little tavelette made the difference. It is simplicity itself, but a simplicity which is the result of prolonged experience and skill. It helps better than any other method I know of to unwind the cocoon regularly and straightly. It is the offspring of the skill of an Italian named Consono, and it is known in Italy as the Tavelette Consono, and is more or less the system of reeling in Italy and France; therefore I am not advocating it as any particular or pet form of instrument; still less must it be considered that I have any but a scientific interest in it; I am not its agent or protector; it passes into my *pot-à-feu* of disinterested work in sericulture for India's good alone.

"I will pause here to consider an objection or two. No effort is ever made at improvement without creating objections and objectors. I anticipated these. I had not had my Tussur experience for nothing. For years at first I heard nothing but objections and prejudices against the utilisation of Tussur silk, some of which ceased only when the objectors found they could object no longer.

"I know I may be told that although this system of reeling yields a better thread of raw silk, the cost of reeling is increased, and that with the present competition it will not pay. I will answer this objection in several ways.

"First, the fault, which I do not admit, lies in the competition and not in the machine.

"Second, I am not disposed to admit that it would be wise to sacrifice any improvement that can be made in quality because the value of the raw silk is enhanced thereby. When I was in Bengal the price of good reeled silk was 11*s.* per lb., now it is 14*s.* 6*d.*,* and this is more than the proportionate increase as compared with the rise of prices of other silks, this excess over others

* During the time that this paper was passing through the press, the price increased to 15*s.* 6*d.*, and, owing to the increased demand, the stocks in London are quite exhausted. The new supply will be from the November bund.

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being simply the result of improved reeling, whether with the tavelette or not is of no importance to my argument.

"Third, I am certain that if the Italians ceased to use their tavelette and adopted the one I found in use in India, their silks would at once become of less, probably much less, value in the market. They hold their remarkable values, some 6*s.* per lb. over and above Bengal silks, in a great degree to the beautiful way in which they are reeled. In fact it is possible to buy badly reeled Italian silks at 14*s.* 6*d.* per lb. or only a little more.

"Fourth, I was informed in one large Bengal filature that the cost of reeling by this European method would in all probability be little or nothing in excess of the old method as soon as the reelers had familiarised themselves with its use.

"I have received a letter from Mr. Morey, of the well-known Surdah Filature, in which the following remarks occur:—

"'I have reeled some 10/11 deniers and 25/30 deniers by your European method, and highly approve of it. In fact I am going to reel several bales to test the market. You will be pleased to see the 25/30 deniers, which is a very good silk and unwinds beautifully. You will find no foul places in it, and I sincerely hope that it may prove acceptable to the sewing silk manufacturers. I consider that we have never made such good even size and winding throughout the skein as we get now, and to do this of course there is very little waste.'

"One thing has been proved, and I have been permitted to bring it home to the minds of impartial and unprejudiced manufacturers in England and on the Continent, that the Bengal cocoon has not the inherent imperfections which it was thought pertained to it, and that there is a prospect of a greatly enlarged output of silk from Bengal for several important purposes in the silk trade of Europe and America.

"There may be men in the city who may tell us that Bengal silk, to use a familiar expression, is a thing of the past; but I ask, are they manufacturers? Are they sericulturists? The opinions of practical workers of silk, coupled with my own knowledge of its structure, are of more importance to my argument than what may suit the exigencies of the market to gainsay or to uphold. You have heard what I have got to say about the fibre of Bengal silk—the *practical* opinion which has taken thirty-five years to form, and a *scientific* opinion based upon observed facts. I will now give you the opinions of a few manufacturers who have been recently working better reeled Bengal silks.

"First, Sewing Silk.

"Several of the best manufacturers of silks for sewing purposes in Leek have assured me, after full examination and trial, that this silk is peculiarly applicable to their trade.

"Mr. S. Gibson, a Leek manufacturer, writes:

"'I am very pleased with the five bales of Bengal silk I have just bought; they work very freely, almost running from beginning to end of the skein without breaking down, which means winding without loss. The strand is of nice even size, suitable for the Leek trade, free from rough or slubby places, so much so as to render one important process in the manufacturing unnecessary, viz., cleaning.

"'I am working these new Bengals in both the bright and washed state, and they are coming out at about one-half the cost of original Bengals. If this improved reeling is maintained, it must have a serious influence on the China and Canton raws.'

"Mr. S. Goodwin, another silk manufacturer, and President of the Leek Silk Association, writes:—

"'I have worked the sample skein of Bengal raw silk, and am pleased to say that it is simply perfection. As to reeling, I may say that it wound almost without a break from end to end.'

"This silk was reeled by me in Bengal with the Tavelette Consono.

"The silk of the Bengal worm, by its greater elasticity, is much better adapted for sewing silk than any other. I have estimated, in experiments conducted during the last few days, the tension of the bave, or double fibre deposited by the silk-worm, of the Bengal Madrassee or hot weather cocoons, the Bengal Desi or November bund cocoons, and of Italian cocoons. The results are shown in the following table, each figure being the average of numerous determina-

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tions, and representing the number of centimetres, which three decimetres of the bave is capable of extending before it breaks:—

	Tension at the end of the cocoon bave which is at the surface of the cocoon immediately beneath the superficial loose fibres or waste.	Tension at the middle of the cocoon bave.	Tension at the end of the cocoon bave which is nearest the telette or inner envelope.
Madrassee Cocoon . .	4·4	6·3	5·6
Desi Cocoon . . .	3·6	5·7	4·8
Italian Cocoon . . .	2·6	4·9	3·3

"Second, Organzine and Tram for weaving.

"Mr. Nicholson, silk manufacturer, Macclesfield, in a letter to me, writes the following:—

"'In answer to your enquiry, I consider that good Surdah raw, when well reeled with plenty of spin upon it, will work well. It will then be a good substitute for Italian, its cheapness being the reason for its use.'

"In addition to this, I may say that Mr. Nicholson is speaking of a Bengal silk that was not reeled by the Italian method. I contend that there would be no greater evenness of thread in the Italian silk over Bengal if the Italian method of reeling were used.

"Messrs. G. Davenport & Co., of Leek, to whom I sent a portion of the 10 to 12 deniers, which I saw reeled by the Tavelette Consono in Bengal, have thrown it into organzine and tram, and send me the following report:—'The slip winds beautifully. Enclosed are samples of two threads tram and a 500 yards skein of organzine. The silk is very clean. We consider it equal to ordinary Italian. It was running for an hour and only broke down once.'

"Now it is necessary to say that, even with every improvement, Bengal silk may not be expected to rival or supersede the *finest* qualities of silk in the market. An objection or two from me may suffice. It will never be as white as China silk, because one is from a yellow cocoon and the other from a white one. It will not boil-off or condition as well as the silks of Italy, China or Japan, because it contains more gum or grès than these, and this brings me to an entomological point, namely, it is probably not of the same species, but of this further on.

"I must guard myself against being thought slack in acknowledging the claims which at least three well-known Bengal firms have on the consideration of European manufacturers for careful reeling. The excellence of the silk produced at Surdah and its allied factories in the District of Rajshahi and other parts of Bengal, that of the Bengal Silk Company's factories, the chief of which is at Berhampur, and that of the well-known firm of Messrs. Louis Payen & Cie., are too well known to need mention. I acknowledge with much pleasure the kindness I received from them all, and they are well deserving of the confidence of all interested in silk.

"But apart from the efficiency of these well-known firms, there remains the much larger native industry, the reeling that is carried on in the numerous villages under the shade of banyan, palm and mango groves. I visited many of these and found the appliances very rough and rude, the reeling by them varying from 10 to 20 cocoons in almost as many seconds.

"In the Rajshahi District alone, out of 97 filatures, 63 are native and the remaining 34 European, eleven to twelve thousand natives being employed in silk reeling in this district alone, 150 square miles of which exist under mulberry cultivation.

"If these village native filatures can be induced to improve their reeling, a largely extended industry lies waiting for them in their own country; for it goes without saying that the resources of China and Bokhara would not be drawn upon if Bengal silks were of the required quality. Many native manufacturers assured me they would much prefer to buy Indian silk if only the quality were good enough. The consumption of silk for native uses alone is enormous. All Hindoos wear it at meals or worship. The Mahomedans wear Mashru, or cloth of cotton-warp and silk weft, the wearing of pure silk fabrics being forbidden by the Koran.

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"Since I was in India another silk-reeling machine has been brought to my notice by the Under Secretary of State for India. Its inventor, Mr. Serrell, of New York, claims for it that unskilled labour can be used with its aid in reeling cocoons. This machine is automatic, and by means of a feeble electric current which controls the feed, takes up another cocoon thread when one breaks, so that a new cocoon is added whenever required to keep up the size of the thread. It is stated to do two and a half times as much work as the present system, at a saving of 2*s.* 9½*d.* per lb. in wages, and one reeler can attend to six bassines. Two of the largest silk-reeling firms in France are in treaty with Mr. Serrell for the examination of this remarkable invention, and are willing to adopt it if its expectations are realized. I am very sorry not to have been permitted to have this machine at work in this Exhibition side by side with the other two. Should it really be able to do what Mr. Serrell claims for it, it will be a valuable addition to the Bengal silk industry, and I commend it to those interested.*

"Indian Sericulture has received a new impetus in a scientific direction. When in Calcutta, I suggested to Mr. Buck the desirability of a scientific investigation of the silk-worm being commenced with a view of enquiry into and amelioration of disease, the breeding of the worms, the growth of the mulberry food, the exorbitant rental of the mulberry lands, and all that relates to the production of good cocoons.

"Mr. Buck acceded, and at once set about organising the means without raising objections. He charged the Indian museum at Calcutta with this enquiry, and Mr. Wood-Mason, the assisting superintendent, immediately began it methodically. The first fruits of it are to be seen, I am delighted to state, in the Indian Silk Culture Court, in a series of cases of moths and cocoons of extreme interest. Hitherto the entomologist has alone occupied this field of research, but now the zoologist takes part with him in the study, and we may confidently anticipate that, when biological and morphological attention has been directed to the subject, we shall be in possession of much valuable information, which in my opinion Bengal sericulture has for a long time greatly needed. Thus the absolutely entomological phase merges into the zoological one, and the morphological study of egg, larva and moth becomes an important adjunct to this industrial pursuit which cannot fail to be greatly strengthened thereby. A sericultural laboratory has been constructed at the Indian Museum, Calcutta, and life studies of various species of silk-worms are being daily conducted.

"Already Mr. Wood-Mason has found a disease in the Bengal worm which proves fatal, to the extent of 60 per cent., and which was not previously suspected. Even its existence was by some observers denied.

"In the published catalogue of the collection he has sent over, he states the Desi or indigenous cold weather moth to be *Bombyx fortunatus*, and the Nistry or Madrassee one *Bombyx cræsi*. The Eria silk-worm he calls *Philosamia ricini* instead of *Attacus ricini* as heretofore, and *Antheræa Assama* is changed into *Antheræopsis Assama*.

"It would be wrong if I did not here mention the great service to the entomology of Indian silk rendered by Mr. F. Moore, to whom is accorded by European consent the highest authority on this subject. For many years Europe has been indebted to him for much patient and laborious investigation, and it is to be hoped that his researches will before long be published.

"In the French report of the Lyons Silk Laboratoire for 1885, of which I shall say more shortly, is the drawing of a new Chinese bivoltine wild silk-moth, feeding on the mulberry tree, which Mr. Moore has named *Rondotia Menciana*. This genus is a new one, and is so named by him as a souvenir of the important works on silk of my old friend and former president, Monsieur Rondot. The specific name is to recall to recollection the old Chinese philosopher Mencius.

"It may turn out that the term "Mori" may have more of a generic significance than specific, indicating simply the mulberry feeders. In fact there is some doubt as to whether we really know what *Bombyx mori* means, or whether it exists at all.

"I feel certain there is a great difference between the mulberry-feeding silk-worms of Bengal and the so-called *Bombyx mori* worm of China and Japan, which is the kind now being acclimatized in North India. The extraordinary difference seen in the respective cocoons shows this plainly enough.

"The Bengal worm I consider to be exactly suited to the Bengal climate.

* I have arranged for a practical trial of it at the Society of Arts in September next, to which gentlemen interested in Sericulture will be invited.

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"I do not believe they can be acclimatized in Cashmere, the Panjab, the N.W. Provinces, or in Assam, but without doubt the *Bombyx mori* can, and it is the proper worm to try there. Whether they have structural differences sufficient to be *specific* I must leave to entomology and biology to determine. If they are not *specifically* different, there is sufficient divergence to group them as distinct varieties of the Mori, and I repeat they are exactly suited to those parts of Bengal where they are found, and through which for the most part the Ganges flows. I believe also they are indigenous to this part of India.

"It may be useful here to state that the Bengal silk-worm of the rainy and hot weather bund or season is called locally the Nistry-poloo and Madrassee worm; that of the November or cold weather bund or season is called the Desi or Chota-poloo worm; they are designated by Mr. Wood-Mason respectively *Bombyx cræsi* and *Bombyx fortunatus*, though perhaps only provisionally.*

"Concurrently with this branch of enquiry I most strongly advocate the commencement of a structural one, such as has been started in Lyons, and that the fibres of all kinds of cocoons should undergo systematic examination and be recorded. In this way one enquiry will help and strengthen the other. To be of practical and industrial use, both should be conducted simultaneously; for all manufacturers here will, I am sure, agree with me that it is of the first importance that the strength, elasticity and thickness of fibres should be known, as well as their varying states in health, disease and changing climatic conditions.

"The importance of this would soon be seen in the comparison of Bengal silks with those of Cashmere, the North-West Provinces and the Panjab, and valuable information as to climatic conditions obtained.

"From these comparisons with the better known silks of both East and West would be made, and important data established.

"In England we have done nothing which may be considered to be strictly scientific in silk work. Fortunately we are not long behind France, and I hope Mr. Buck will influence the Government of India in this direction. Besides these points, we do not know much yet about the chemical composition of silk and its gum, or about its properties of combining with other substances, whether as dyes, mordants or adulterants. I am at present at work on spectrum examination of dyed silk and dyes, and on chemical methods for the detection of the amount and nature of the weighting matter too often found in combination with silk.

"The whole subject entails too great a sacrifice on individual enthusiasm. It wants lifting into the sphere of methodical and scientific work, and no one can then doubt of its ultimate usefulness to the silk industry and its entourage.

"The importance of this suggestion, which I desire so much to press at this opportune moment, I may well further emphasize by mentioning that this week I have received from the Lyons Chamber of Commerce the report for the year 1885 of the Administrative Commission of the Laboratory for the study of silk lately founded by this Chamber. I shall be glad to show it to anyone after the lecture.

"It contains three plates of silk-worms, their cocoons and moths, two of them new. Amongst other things I am pleased to observe the prominence given to my examinations for this Chamber of Commerce of the strength, elasticity, and thickness of a large number of silk fibres, which, with the results of their own laboratory, occupy no less than thirty-six pages of the report. I only mention this to show the high importance the Chamber attaches to all that relates to fibre construction. The expenses of this laboratory work have not exceeded £200, which was the estimated sum voted.

"Is it not time we did something in this direction? America, without any real sericulture, but with a rapidly extending silk manufacture, boasts of a splendidly conducted Silk Journal, whilst England remains without one. I feel sure the only way to recover a leading position is to commence original research and collective action and effort.

"We have trusted too much to individual enterprise and effort. This, without collective action, will never get us into the front, or even into a respectable position as compared with France, and both the products of England and India will continue to suffer in comparison with those which are perfectioned by the leaven of applied scientific research.

* It is these worms which produce the Bengal raw silk of commerce.

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"That there is a great future in store for Sericulture in India is beyond doubt, and if only the same energy were applied as that brought to bear on the production of Indian wheat and Indian tea, the day would not be far distant when the silk centres of Europe would desire the silks of Bengal as much as they now do those of China and Japan.

"That India should take a fair position in the supply of the world's demand for silk is not for Englishman to gainsay. On the contrary, India, with a greatly increasing population, the natural result of a great Continent at peace with itself, and a growing security from depopulation by famine, an improved sanitary administration and more scientific medical enlightenment and instruction, it goes without saying that Englishmen, of all others, should feel the greatest possible interest in the material welfare of India, and especially in everything which tends to the organisation and stimulus of her varied industries, particularly one which is so capable of being so widely spread as Sericulture.

"Tussur silk, as adapted for export, has been, during the last ten years, very slow in taking root in India, and large supplies have had to be obtained from China to meet the gradually growing European demand. At the Paris Exhibition of 1878, Sir Philip Cunliffe-Owen determined to give this silk an opportunity of asserting itself, and afterwards, in the India Museum, he took care that its capabilities and uses should be conspicuously depicted. Not a little of the industrial growth of this useful though wild silk is due to his encouragement, and now in this Exhibition can be seen the fruits of all the care which has been bestowed upon it in various ways, and I am more than pleased to state that India now has an enormous demand.

"A number of gentlemen in India are vieing with each other to improve the methods of reeling, and with singular success. In the cases set apart for Tussur silk are shown results which a few years ago would have been thought to be impossible. Already this silk is capable of far more extended uses than ever before, and although it cannot be expected, on account of its structure and properties, to take the place of the more beautiful silk of the Bombycidæ, it has its uses, and those in a much higher degree than it was ever thought susceptible of.

"Besides the silks already mentioned, there are others, such as the Eria silk, obtained from the *Attacus ricini* silk-worm, which will gradually find extended utility; and great lessons will be learnt by those who care to observe, in these varied exhibits, both in the reeling of the cocoons, the spinning of the waste fibres, and the dyeing and weaving of the silks.

"On both sides of the Ganges, Bengal is capable of producing silk to a vastly extended degree, not only enough for all the requirements of India, which are really very great, both for weaving, embroidery, and minor purposes, but for a greatly increased export trade. Under European careful supervision, the native Indian works beautifully. He cares more for patient manual labour and real handicraft traditional work than he does for progressive thought or invention, and it is not to be wondered at that it has been left to the quicker brain and the desire for development that characterises the people of the West to produce results which find a readier market than his own unaided and unguided efforts can secure.

"I have spoken before of our responsibilities with regard to India, and I am glad to be one of those who feel more for India in those respects which relate to produce which we can buy from her than in those which we have to sell to her.

"To see the exports from India grow is a duty we owe to this beautiful country, and we should be gainers thereby. Such a practical and unselfish regard for her welfare would constitute the strongest bonds of Empire Federation and enable us to look upon our Indian fellow subjects more in the spirit of the now-a-days too rusty Christian precept of loving our neighbours as ourselves, happily embodied and expressed by Mr. Edwin Arnold in his sonnet preface to his 'India Revisited.'"

"India, farewell! I shall not see again
Thy shining shores, thy peoples of the sun,
Gentle, soft mannered, by a kind word won
To such quick kindness! O'er the Arab main
Our flying flag streams back; and backwards stream
My thoughts to those fair open fields I love,
City and village, maidan, jungle, grove,
The temples and the rivers: must it seem

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Too great for one man's heart to say it holds
So many many Indian sisters dear,
So many unknown brothers? that it folds
Lakhs of true friends in parting? Nay! but there
Lingers my heart, leave taking; and it roves
From hut to hut whispering, 'he knows, and loves.'
Good bye! Good night! Sweet may your slumbers be,
Gunga! and Kasi! and Saraswati!"

The paper was illustrated by the aid of a dissolving view apparatus, by examples showing the enlarged microscopic appearance on the screen of the fibres mentioned below.

1. Cotton, showing its flat and twisted fibre of cellulose.
2. Flax. The elementary fibres of flax (*Linium usitatissimum*) are cells of pellucid membranes, joined end to end with cane-like joints, between which form thickened vessels with fibrous matter; along with these are seen the woody fibre or tissue consisting of "elongated cells or tubes, with tapering extremities which overlap each other, and by their union longitudinally form the fibres called hemp or flax."
3. Typical wool fibre, showing the imbrications at its joints.
4. Fibres of Chinese wool.
5. Merino wool, American.
6. Fibres of Mohair. (Mohair is the wool of the Angora goat of Asia Minor).
7. Fibres of Alpaca. (Alpaca wool is from a Llama of Peru).
8. Kempy wool fibres.
9. Diseased wool.
10. Typical mulberry silk.
11. Mulberry silk *baves* of unequal diameter. The *bave* is the double thread as deposited in the cocoon by the silk-worm. The *brin* is either of the single threads or fibres composing the *bave*. The *bave* and consequently the *brins* vary in diameter in the same cocoon, being thinner in the first and last portions reeled and thicker in the middle. The two *brins* are often found to be of unequal diameters, and this occurs mostly in the first and last portions reeled from the cocoon.
12. Silk from cocoon of the *Madrassee* or *Nistri poloo* silk-worm of Bengal (*Bombyx crœsi*). Rainy and hot weather bund.
13. Silk from cocoon of the *Desi* or *Chota poloo* silk-worm of Bengal (*Bombyx fortunatus*). November or cold weather bund.
14. Silk from the cocoon of the mulberry-fed silk-worm of China.
15. Silk from the cocoon of the Tussur silk-worm of India (*Antheræa mylitta*).
16. Silk from the cocoon of the Tussur silk-worm of India (*Antheræa mylitta*), showing the form in which the silk is laid in the cocoon by the silk-worm.
17. Tussur silk, dyed black.
18. Silk from the cocoon of the Muga silk-worm (*Antheræa Assama*).
19. Silk from the cocoon of the Eria silk-worm (*Attacus ricini*).
20. Silk of the spider *Nephilengys malabarensis*, Walck, found at the Lake of Bhím Tál, in Kumáun District, North-Western Provinces, by J. F. Duthie, Esq., of the Botanical Gardens, Saharanpur.

DISCUSSION.

Mr. C. W. Marshall said that Mr. Wardle had compared the silk of a hundred years ago with that of the present time, but it must not be forgotten that whereas the former was produced in the time of the monopoly, and was of equal quality, that produced now was made in great part by the natives only, frequently without supervision, and he did not think there was any falling off in the quality of the silk reeled by European firms; indeed he was quite convinced that there was an improvement. Mr. Wardle had spoken of the market in England at the present time and compared it with that at Calcutta when he was there six months ago, and had suggested that the rise in prices which had taken place in that time was in undue proportion to the rise in the value of the silk generally, and which he attributed to the progress made in the reeling during the time

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he has been away. It was certain that an improvement had taken place, one of the causes being that the Bengal silk now wound better than formerly; ends had diminished by more than three quarters. He quite agreed that much could be done for Bengal silks, but it must be by the assistance of the Government. For instance, with regard to the diseases of the worm, of which the natives at present knew nothing, something could be done by informing them of the results of European research, pointing out the causes of disease and the methods of preventing them. The natives however would never rear cocoons according to European methods, and anything written on that subject would be so much waste paper. To a great extent the remedy lay with gentlemen in England, because those interested must know that the production of Bengal silk had for some time been almost *nil;* the reason for this state of things was that European firms in India had not been making money, in fact they had great difficulty in existing at all. Of course every man must consider his own interests, and the margin of profit being so small they were compelled to go on in a hand-to-mouth fashion. He thought the buyers would be consulting their own interests in the future if, supposing them to be doing any better in the way of profit, they would make over a little of it to the producers now; unless they did this the reelers could not afford to improve the silk, although it could be done immediately if they met with proper support.

Mr. A. Nicholson, J.P., silk manufacturer of Leek, would not like the meeting to separate without one word from the town of Leek to say how gratified they were to see Mr. Wardle coming to the front to assist India and the silk industry generally. When Mr. Nicholson first went into business, a great part of the silk used was from Bengal, but after a time it became so unworkable that manufacturers were completely at their wits end to get sufficient to meet the demands of the trade, when Canton silk came to their rescue and proved their salvation, for they were enabled to quadruple their output. He was glad to say that they now got silk from Bengal which was nice, level, and clean, and which reeled freely with very little waste. It had come too at an opportune time, for the Canton silk had shown marked deterioration during the last year or two. Here was therefore a good opportunity to take advantage of a silk which would keep up the standard, and perhaps even supplant the Chinese silk. But it was not possible to pay a higher price for Indian than Chinese silk, and the reelers must look to recover their position by improving the quality, and so raising the demand. It was certain that more would be used if the quality were maintained equal to what had been received lately. Some of that sent lacked the "bone" of Chinese silk, and was therefore not suitable for some purposes, but there were many other uses to which it could be put if the quality of 25 or 30 deniers mentioned by Mr. Wardle could be relied upon. Silk of that character was last year about 12*s.*, this season it is 14*s.* 6*d.*, while No. 1 Chinese is only 13*s.* This margin of 1*s.* 6*d.* he did not consider too much because the Indian reeled more freely, but it could not be increased without driving manufacturers back to Chinese; although, other matters being equal, preference would of course be given by English silk manufacturers to the productions of their own Empire.

Mr. S. Gibson stated that he had lately bought a quantity of these better reeled Bengal silks, and had found them most satisfactory. They were amongst the best he had ever had in his machines, and he felt that the Chinese and Japanese silks would find in them a most formidable rival.

Mr. Hewitt (late Commissioner of Chotah Nagpur) testified to the very great assistance Mr. Wardle had given him in suggestions for reeling and developing Tussur silk in his district, which was about the size of Ireland, and contained an abundance of this silk. It would result in spreading the use of the silk, and in re-introducing a most valuable industry to the country. Formerly the natives cultivated a small piece of land in the forests, which were now being cleared, and it was necessary to instruct them that the trees could be as well cultivated near their own homes; no doubt Tussur silk would then reach a position similar to that occupied by other silks. He heartily joined in thanking Mr. Wardle for his disinterested labours.

Mr. T. N. Mukharji, as a native of India, thanked Mr. Wardle for his efforts to revive the Bengal silk trade, and believed his countrymen would join in any organized effort to bring this industry into its proper place. He believed there were three obstacles to this, first the deterioration in the quality of the silk, which could be cured by more careful cultivation; second, the faulty reeling, which could be remedied by the introduction of the process described by Mr.

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Wardle: the third obstacle was the price, and he thought the cost of production could b lessened, especially in getting rents reduced from the exorbitant charges now made wherever th mulberry tree was under cultivation. Mr. Mukharji assured Mr. Wardle and the English sil manufacturers present that he would on his return to Bengal do all he could to induce the nativ reelers to improve their methods, and that he was certain they would be quite determined to tak such measures to improve the quality as would bring it up to the desired European standard.

Mr. J. J. J. Keswick, of the firm of Messrs. Jardine, Skinner & Co., Calcutta, thought ths the attention Mr. Wardle had attracted to the Indian silks, the hints he had given, and th examples he had shown were likely to be productive of very great good, but he looked to th Government taking up the matter, and being prepared to subject sericulture in India to scientifi examination. At the present time England was very much behind France and Italy in thi matter, and he was glad to think that the visit to India of Mr. Wardle, and the energy of Mr Buck had induced the Government to take the matter up, for in the present day scientific researc was the guide to everything.

Votes of thanks to Mr. Wardle and to Mr. Buck (proposed by Mr. Vincent Robinson) closed the proceedings.

I have not thought it necessary in the foregoing paper to discuss the obstacles which ar purely local, such as the high rentals of mulberry land, which are telling seriously on Bengal sericulture.

These will be found fully treated of, as well as suggestions for overcoming them, in my speech at the Silk Conference in Calcutta on the 8th of January last, and since published by the Government, with illustrations of the improved methods of reeling I suggested.

I am happy in this place to acknowledge the assistance I have received from my esteemed friend Mr. Gupte, of Bombay, whilst writing this catalogue. He has in the kindest manner supplied the explanation and description of those fabrics having local meaning and interest, notably those which contain decorative treatment symbolical of the religious faiths of the peoples of India, such as will be found under Nos. 83–91, 99, 240, which are full of interest, as well as others.

The description of the interesting exhibits of Indo-Persian figure weaving is by Mr. G. Bermingham, Leek.

My thanks are due to my assistants, Mr. Rigby, Mr. Greenwood, and my son Arthur.

All the exhibits will be found under the heads of Provinces, with a few exceptions, which have been unavoidable, owing to the arrangement of the show cases.

I am indebted to Monsieur A. Wailly for several species of living larvæ and cocoons, which, with others I brought from India, have proved of high interest to the public in the Silk Culture Court. Monsieur Wailly, in addition to being an entomological student, is an importer and breeder of and dealer in many species of silkworms, their eggs and larvæ, and it may be useful to the numerous enquirers at the office of the Indian Silk Culture Court and to the public if I give his address. It is Tudor Villa, Tudor Road, Norbiton, Surrey.

I am preparing a report on the Exhibits of Colonial Silk, at the wish of H.R.H. the Executive President, which will be published by the Society of Arts, with other industrial reports.

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CATALOGUE.

SINGAPUR AND BURMA.

1. Plaid silk on red ground. Colours, white, ɔllow, orange and b'ack. From Singapur.

2. Plaid silk on red ground. Colours white, ɔllow, orange and black. This plaid is ar-ɪnged very thoughtfully in double white ɪuares, intersected by double squares of black, ɔd, and yellow lines—an excellent disposal of nes intersecting at right angles. This design ives the idea of a cross, in colours, inside white ɪuares, as also in No. 1. From Singapur.

3. Silk piece striped with yellow, white, red, reen and black bands in the warp, and red in he weft. Upwards of twenty longitudinal tripes per foot. Each stripe has a neat border n each side. From Singapur.

4. Woven silk with the warp in black, red nd yellow stripes, and the weft dyed in bars f yellow and black by steeping it first in the ellow dye, and then tying knots, after the nanner of the Gujrati "tie-and-dye" method, o protect that tint in some parts, and finally teeping the yarn in the black dye. This is a urious and very interesting pattern. The ppearance of monotony and regularity has been avoided by a shadowy yellow interlacing pattern after the style of the Greek fret having been placed in the longitudinal stripes. From Burma.

5. Striped fabric. The warp in white, yellow, green, orange and maroon bands, and the weft dyed by knot-tying in corresponding tints. From Ava, Burma.

6. Longitudinally striped fabric with green, black, yellow, orange and maroon in the weft (black predominating), and corresponding tints in the weft produced by knot-tying. In all these Burma pieces there is an obvious intention to avoid a distinct line or edge. In this fabric it is done by a slight overlapping of colour at the edges of the stripes, and in No. 12 by shading and unevenness of colour. From Burma.

7. Woman's garment. The warp in white, yellow, blue, purple, and red tints, produced by knot-tying and the weft in bands. The border of this piece is in wavy festoons, perhaps conventional cloud weaving as in China and Japan. From Tennaserim, Burma.

8. Silk shawl from Pegu Burma, with red warp, and yellow, white, green, black, blue, and red weft. The process of weaving this fabric is intricate and interesting; it resembles that followed in weaving some carpets, where one unbroken thread of the weft is not laid from one end of the fabric to the other along the entire breadth of the loom, but is drawn aside and substituted at intervals, and used again when required to produce the figures of fish, birds and animals. This is a splendid specimen of the manipulations of the handlooms of the farther East. The red warp and black weft in certain portions of this fabric produce a very pleasing purple. The conventional appearance of scales of fish, some blue and others green, is remarkably interesting. Fishes, turtles, and lotus flowers, stems, buds and leaves, are also seen in tanks or small lakes, and parrots and peacocks occur in other parts of the design, one part of which consists of the section of a vase filled with deep ruby-coloured silk. On the rim of the vase stand two green parrots facing each other and apparently guarding a chalice which is placed in the centre of the vase on the ruby silk. The pattern work is in white, salmon, green, yellow, blue, ruby and violet on a red silk ground, with here and there Chinese-like embellishments of silver thread lines, sparingly introduced. This is no doubt a Buddhistic cloth, but I am sorry I have not been able to find an explanation of its evident symbolism.

9. Woman's garment from British Burma with designs in conventional figures of elephants, lions and geometrical forms with rosettes resembling some of the sculptures on the English runic crosses. The warp in this example is dyed in white yellow, green, and red, while the weft is used in plain alternate bands of red and white. Economic Museum, Calcutta.

MADRAS PRESIDENCY AND TANJORE.

10. Woman's garment in black and yellow plaid. In this plaid the transverse yellow is predominant and is characteristic of the design. From Tanjore, Madras.

11. Striped silk fabric in red, white, black and green bands. Burma.

12. Striped silk piece in yellow, orange and white bands. Burma.

13. Red *sari*, with an interesting pattern woven in gold. Madras.

14. Green and red silk and cotton *sari*. Madras.

15. Woman's garment from Arni, North Arcot, in red plaids and black lines with yellow borders and ends. This fabric has broad yellow borders with white and black lines

and interesting transverse bands of partial wefting.

16. Silk from Madras with dark blue and yellow stripes, dark blue predominating and interspersed with white streaks.

17. Plain Corah orange handkerchief. From Kistna, Madras.

18. Silk dress piece in very neat plaid, white, green and red. Tanjore, Madras.

19. Red silk jacket piece embroidered with flattened gold and silver wire. From Madras.

20. Black silk embroidered with flattened gold and silver wire. Gold flower sprigs and circular spots. Used for bodices. From Madras.

21. Woman's garment in white, yellow, red, and black, the warp being in yellow, black and white bands, and the weft in corresponding tints. In this example the weft when not yellow (which is the colour of the border) is taken back just as it reaches the inner side of the warp threads of the border on both sides, its place in that part being taken by a new and supplementary yellow weft. The broader bands are made to terminate at the inner border in deep comb-like serrations. From Tanjore.

22. Ruby silk loin cloth with very pretty black and white border. From Berhampur, Madras.

23. Black silk shawl with red, green and white border from Bangalore. From Madras.

24. Red silk shawl with white, green and yellow border. From Bangalore.

25. Figured silk scarf. White figured centre, crimson and white border in cones bounded at the top and bottom with a narrow figured border in black and red. From Bangalore, Mysore State.

26. Woman's garment with forcible black and orange plaid with yellow sides and ends. The transverse black bands terminate in a deep triple serration. From Arni, North Arcot.

27. Silk plaid in white, red and purple. From Tanjore, Madras.

28. Red silk piece with narrow yellow lines intercepted by black cross lines and gold spots. This is an example of the simplest and one of the most primitive types of gold brocade. From Tanjore, Madras.

29. Purple satin mushroo with white zigzag bands and yellow and red-dotted lines. A pleasing effect. From Madras.

30. Woman's garment, red with yellow zigza lines and pretty border. From Bangalore Mysore State.

31. Woman's yellow and red plaid Sar with red borders and gold ends. This is remarkably fine Sari, with very conventiona flowering trees in the border. From Tanjor Madras.

32. Silk plaid in white and sea gree From Tanjore, Madras.

33. Silk piece in green, red, white, and blac plaid, green predominating. From Tanjor Madras.

34. Woman's garment in black, red, an maroon squares, and yellow lines tastefull interspersed with gold thread. From Tanjore.

35. Turban with gold borders. From Salen Madras.

36. Piece in red and white plaid. Fro Tanjore, Madras.

37. A plaid in white and black, with re marginal lines. From Tanjore, Madras.

38. Silk piece in white and black stripe woven on a red warp. From Kistna, Madras.

39. Petticoat silk, from Madras. Green an black and yellow, and black shot woven on black warp with white and purple bands across

40. Silk *soosee* piece, from Madras, with black and yellow stripes, and also yellow an green lines interspersed with streaks of white.

41. Yellow and red plaid woman's garment From Cuddalore, Madras.

42. Silk bodice piece. A charming gold an red admixture of colour in repetitions of a narrow pretty border pattern. From Mysore.

43. Purple satin trousering with white bands This fabric has a purple ground with white wavy transverse bars, intentionally very irregular. From Aurangabad, H.H. the Nizam's territory.

44. White satin *mushroo*. A damask in striped patterning. From Deccan, Hyderabad, H.H. the Nizam's territory.

45. Red satin with stripes of gold thread and pale red silk. From Deccan, Hyderabad.

46. Purple satin brocade, in a pattern of small pretty flower sprigs in frequent repetition. From Deccan, Hyderabad.

47. Blue satin on a red warp, giving a violet effect, striped with gold. From Aurangabad, Nizam's territory.

BOMBAY PRESIDENCY.

48. Silk fabric from Bijapur, Bombay. Gold colour on red ground, used for bodices. The design is called "*ruiphul*," or the flowers of the *Calatropis gigantea*, which (made into a wreath) are required for the marriage ceremony of the high caste Hindus.

All other preparations and ceremonials are but the accessories of the most auspicious and essential one of the bride's putting the sacred wreath of the *rui* round the neck of the bridegroom. Hence this flower is considered very auspicious.

I would call attention to this beautiful fabric, which is a typical specimen of Bijapur designing, colouring, and weaving. There are other examples in the Bombay Court. I am indebted to the Bombay Committee for this very interesting example. A very effective appearance is produced by small spots arranged in diamonds between the flowers. To do full

justice to this silk, it should be seen as worn in folds, the most effective disposition of most silks.

49. Child's embroidered shirt or *jhabla*, embroidered with white floss, with yellow spots on black satin ground, from Surat, into which it was introduced in early days by the Parsi settlers; it is hence called the "Parsi *Jhabla*" in India. Surat, Bombay.

50. Silk garment woven by the high caste Gujrati brides during part of their marriage ceremony. It is generally a present from her maternal uncle. The figured designs are produced by a very ingenious and intricate process of weaving, requiring great skill, in which the warp and the weft are separately dyed in bands of colours in the manner of the Gujrati with the help of the *bandana* or knot-tying and dyeing. Surat, Bombay. It is called *patolo*.

51. Silk brocade, white and yellow on red ground. From Surat. The design is called *Khapedi ma phul*, or flowers in zigzag lines. Surat, Bombay.

52. Silk brocade, white and yellow on red ground. From Surat, Bombay.

53. Silk brocade *Himro*, white and red on black and yellow stripes. From Surat, Bombay.

54. Silk brocade *Himro*, yellow and red on black ground. From Surat, Bombay.

55. Silk brocade *Himro*, white and yellow on black ground. From Surat, Bombay.

56. Silk brocade *Himro*, white and yellow on red ground. From Surat, Bombay.

57. Silk brocade *Himro*, yellow and white on black ground. From Surat, Bombay.

58. Silk brocade *Himro*, yellow and white on black ground with red spots. From Surat, Bombay.

51 to 58, with 75 & 77 are a typical series of silk brocades of very thick texture woven in Surat. They are of great beauty and interest, and are much worn by rich Arabs who import them. The colourings are of great delicacy and the designs are very characteristic. In Nos. 51, 52, and 56 is shown great taste in the use of red, gold colour and white, not only in their disposition in the design, but in their respective tones, in which exists thorough harmony. The same may be said of Nos. 54, 55, and 75. No. 52 has a minute green spot for the centre of each flower. They are all studies, and I consider them exquisite stuffs.

With regard to the designs of these brocades, I may describe them as of Arab or Mahomedan forms, chiefly geometrical, for even in those of the more floriated treatment there is more or less of geometrical spacing. Probably the severity of this treatment gave way to an enrichment of foliated forms as in No. 56, in which this idea is worked out in an exceedingly beautiful way. Nearly all of them may be considered to be in or from the diaper manner of design so universal in India.

I selected them very carefully from the small stocks in the hands of the manufacturers in Surat, avoiding those dyed with aniline dyes or kindred derivatives, the colourings of which I found utterly destructive of all beauty and art.

The idea of the central portion of the design of No. 54 is taken from the pine apple.

59. Gold, silver, and red silk Kinkhab. A beautiful treatment of gold and silver in double diaper on crimson silk. The geometric flower is spotted in the centre with blue silk. From Surat, Bombay.

60. Gold, silver, and black silk Kinkhab. This is a most effective treatment of gold and silver weaving on black silk ground. The design is called *Chasam phul*, from a flower of that name. The flower, of eight petals, is in gold, and is in the centre of diamond-shaped lattice work, with silver four-petalled smaller flowers at each intersection. In this as in all the kinkhabs the gold and silver are of the purest description. For the method of the manufacture of gold thread for weaving in India see Nos. 275*a*, *b*, *c*, *d*, *e* and *f*. From Surat, Bombay.

61. Gold, silver, and black silk Kinkhab. From Surat. The design is called *Keri velo*, which means "a creeper with mangoe fruits." Surat, Bombay.

62. Silk and cotton *mashru* (satin) in yellow white, and red lines. From Surat, Bombay. This mixed fabric is specially intended for the use of the Mahomedans who are not allowed by their religion to wear cloth made of pure silk.

63. Silk and cotton *mashru* (satin), in yellow and red lines, the yellow predominating. From Surat, Bombay.

64. Silk and cotton *mashru* (satin), in red, yellow, and white stripes, the red predominating. From Surat, Bombay.

65. Silk and cotton *mashru* (satin), in orange and white stripes, orange predominating. From Surat, Bombay.

66. Silk and cotton *mashru* (satin), in yellow, white, and black stripes. From Surat, Bombay.

67. *Khorji*, or gold and silk kinkhab, from Surat, Bombay. The design is called "*pandadana Kothama ath dani*," that is, an eight petalled flower encircled by leaves. This fabric is specially woven to order for the native princes of Siam alone. The border in which the Buddhist bell ornament is used is in gold on black and red silk, and is most interesting and elaborate.

68. Silk "Sarong," with gold and silver brocades, used by the Siamese princes. In this Sarong fine peacocks are woven in gold on each side of the comb ornament characteristic of Sarongs. Green silk is used in the borders. The fabric is dark crimson silk with gold and silver flower-bosses, the gold ones of two sizes, large and small, and the silver ones all small. They are arranged in diagonal order. From Surat, Bombay.

69. Black silk and gold brocade, with gold border for petticoats. The design is called "*Keri ne Chardani*," which means "mangoes and flowers with four petals. The border of gold is masterly and most effective. Surat, Bombay.

70. Embroidered *sari* borders, from Surat, chiefly used by Parsi women, and sometimes by

the Gujerath women. This variety of embroidery is called "*reshami Bharat Kam*," or work done in hand stitches as opposed to the *Karchobi*, or work done on the frame. From Surat, Bombay.

71. Another embroidered *sári* border. From Surat, Bombay.

72. Silk and cotten *mashru* (satin), for trousering, from Surat, Bombay, in red, yellow, and white stripes.

73. Silk and cotton *mashru* (satin), for trousering, from Surat, Bombay, in red, yellow, and white stripes.

74. Green silk and cotton *mashru* (satin), for trousering. From Surat, Bombay.

75. Silk brocade, yellow, white, and red, on black ground. The design is composed of triangular wedge-shaped characters in white, bordered with yellow, with a small red spot in the centre. The base of the triangles is in an upright position. From Surat, Bombay.

76. Silk brocade, white and yellow, on black ground. The design is called "*Char Khonama chár dáni*," or squares with flowers having four petals. The squares of which this design is composed are set diamond-ways in an exceedingly neat diaper, on violet ground.

77. Silk brocade, white, yellow, and blue. This is the same design as 75, but on a red ground. The spots are green. From Surat, Bombay.

78. Satin with cotton back (*mashru*), in green, white, and yellow stripes. From Surat, Bombay.

79. *Patolo.* This fabric is a duplicate of No. 50, and of the same design. It is a bride's garment, given as a present to a bride, generally by her maternal uncle, during the marriage. It is woven with warp and weft, which have been separately tied and dyed by the bandhana process. The dyer takes a small bundle of warp which has been dyed in the lightest colour found on the warp in the finished piece, and draws in pencil upon it some lines at measured distances according to the design to be produced. His wife then ties the silk, along the spaces marked, tightly round with cotton thread, through which the dye will not penetrate. It is then dyed with the next darker colour found upon the warp, and the process is repeated until the darkest colour is reached. The weft is then treated in the same way, in order that, in the loom, when it crosses the warp, each of its colours may exactly come in contact with the same colour in the warp. The little bundles of warp have next to be arranged in the loom by the weaver, who takes the little bundles of weft one at a time, using each in its own place throughout the design. The *Patolo* is a speciality of a province which includes the territory of H.H. the Gáekwár of Baroda, H.H. the Nabob of Bombay, and the silk weaving districts of Ahmedabad, Surat, and Broach. From Surat, Bombay.

79*a*. Odhani, or silk shawl, beautifully embroidered and ornamented with small circular mirrors. From Cutch. An old piece. Lent by Mr. Wardle.

79*b*. Odhani, or silk shawl, beautifully embroidered with silk on cotton, also old, and with mirrors. Lent by Mr. Wardle.

80. Interesting piece of red satin ornamented with minute white *bandana* spots.

81. *Sári* (woman's garment), red, with plaids in black, worn by Mahomedan women with great precision and neatness. Surat, Bombay.

82. Crimson satin with cotton back (*mashru*). An excellently dyed colour. From Surat, Bombay.

82*a*. Small series of lace borders with gold embroidery. Exhibited by Nam Mian B. Shaikh, Surat, Bombay.

83. Kinkhab. Saddle cloth, from Ahmedabad, Bombay. Gold and silver on dark purple ground. The design is worked in with the emblems of war. The peacock, for instance, is the charger of Kártik Swámi the six headed son of Shiva, and the general of the celestial army. The upright lamp between the peacocks again is emblematic of the eternal monument raised in front of every Shaiva temple to commemorate the victory of *Shiva* over the giant Tripur, which is annually illuminated all round, crowned with a blazing light on the top to remind the devotee how the great enemy was burnt after his fall in the battle. Shiva is the god of destruction, and his name "Har Har Mahádevi" was the war cry of the Marathas. The border of this fabric is elaborate, and is a convolution with seven-petalled flowers, four deep, suggestive of Persian form, interspersed with narrow *motichur*, or herring-bone borders. The whole border is on crimson silk, and is in charming contrast with the purple ground of the centre part or filling of this meaningful kinkhab.

84. Kinkhab table cloth in gold and silver, interspersed with purple, green, and red silk, on black back. It is an adaptation of the saddle cloth, No. 85, to the European drawing-room, and it is the same design. The parrot, which is the chief figure in the design of the border, is a favourite bird in India. The design in the body of the fabric is called "*tara mandal*," or constellation of stars. The border, in five-fold bands, is known in India by the name of *popatvela*, which means "a creeper," with parrots worked in. In this design the parrots' heads are turned back; but in No. 83 the heads are in their natural position. The Hindoos draw their parrots both ways, the Mahomedans only with the heads turned backwards. From Ahmedabad, Bombay.

85. Kinkhab saddle cloth. This is an older example, of the same pattern as No. 84, and belongs to the South Kensington Museum. From Ahmedabad, Bombay.

86. *Ilaicha*, or satin, with yellow and red dotted lines, and yellow and purple streaks, producing a herring-bone effect. This cloth is used only for the *burkhás* or outer garbs, with which the *Parda* or Zenana women cover themselves from head to foot, having only a couple of small holes, covered with gauze, for the eyes.

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This is one of the most curiously woven fabrics in the Court. The lines are in narrow vertical stripes of half-an-inch purple and half-an-inch gold colour, so arranged as to produce diagonal bars of purple and the same of gold alternating across the piece. Each narrow band is bordered with alternating white and red dots. From Surat, Bombay.

87. *Ghagro*, or petticoat, dyed black upon crimson ground, the border part being stopped off by knot tying. Surat, Bombay.

88. Kinkhab, from Ahmedabad, Bombay. Gold or red, superior quality. The design is called *mohor bandi*. from its resemblance to the gold *Mohor* coin of India.

89. Kinkhab, from Ahmedabad, Bombay. Gold, on crimson ground, with green dots.

90. Kinkhab, from Ahmedabad, Bombay. Gold, on crimson ground, with green dots.

91. *Bandhana* silk, from Bombay. White and yellow on red. Bandhana means knot tying, and is derived from the Hindu verb *bandhi*, to tie. The female figures, in the circle at the end, represent *gopis*, or the wives of the cow-herds of Krishna, the eighth incarnation of Vishnu. The elephants and the lotus flowers in the border are sacred to Lakshmi, the goddess of wealth, and the wife of Vishnu. This garment is worn by the Vaishnovite women of Gujrat, who are of the Vaishya or merchant class, the worshippers of the goddess of wealth. The introduction of these symbols into the design can be easily traced to the influence of religion on Indian Art. By this bandhana method the white silk fabric is folded into two, four, eight, or sixteen folds, like folding a letter, corresponding with the number of repetitions of the design required. If two "repeats" are wanted, the fabric is folded once; for four "repeats," twice; for eight "repeats," three times, &c. On the uppermost of these folds the design is printed in lines, with blocks, in red ochre mixed with gum arabic, and then knots are tightly tied at intervals along the lines with cotton thread, in such a way that when the fabric enters the dye beck, the dye will not penetrate to the small portion or spot on the cloth around which the thread is tied. The fabric is then "mordanted" with alum and dyed orange. Then another design is printed upon it in the interspaces of the first which remains tied, knots are tied on the second design, and the fabric dyed red. All the knots are then untied, the fabric spread on a small raised platform, and some of the orange spots touched with indigo to make them green. Bandhani is the name of this process in Gujrat, but in Rajputana and Ulwar, where Hindu is spoken, it is Bandhánú.

92. Silk *bandhana*, from Gujrat. Yellow and white, on red. An example of the most rudimentary work done by knot tying, and illustrating the process.

93. Silk handkerchief in *bandhana* work. This is an elaborate design, and is somewhat similar to No. 91 with the addition of green spots, some of the yellow spots having been touched with indigo. Cutch, Bombay.

94. Silk plaid, from Thana, Bombay, in white, red, pink, purple, and black, the red in broad bands across the piece.

95. Figured silk dress piece, in black and white. Chaste geometrical design. From Thana, Bombay.

96. Figured silk dress piece in grey and white. Same design as No. 95. From Thana, Bombay.

97. Silk plaid in white, black and red. Excellent disposition of lines and bands. From Thana, Bombay.

98. Small patterns of Thana silks. Exhibited by Mr. Wardle.

99. Embroidered border from Cutch, Bombay. Hung on the chief entrance of the house of the Indian merchant or Bania, the worshipper of the goddess of wealth, Lakshmi, whose lotus-shaped throne is worked in the design interspersed with bits of silvered glass, producing a pleasing effect. The great *divali* holidays of India, which extend over four to six days, begin with the worship of Lakshmi, when the whole of the town is illuminated, and when the merchants and bankers invite their customers, friends, relations, and acquaintances to their shops, specially decorated with pictures and carpets, and copiously lighted to receive them. After the customary worship of the goddess, and the new account books for the year which commences the next morning, *pan supari*, or betel leaves and nuts, sweet meats, nosegays and perfumes are distributed among the guests, who pour in one after another till midnight, visiting the shops they have been invited to honour with their presence. It is on this day that this specimen is tied to the doorway and its old predecessor removed.

100. Green silk embroidered scarf or shawl from Cutch, Bombay, worn by women. This and No. 99 were lent by Tribhurandas, the son of Sir Mangaldas Nathubhai, of Bombay.

101. Silk bodice piece from Poona, Bombay; white with squares in red, dotted lines, and a gold border.

102. Silk and gold loin cloth from Yeola. This fabric is curiously woven, red on one side and yellow on the other, and its border is of gold and very dignified. Silk loin cloths are worn during the performance of religious ceremonies and during meals, when cotton cloth is considered impure. It is called *pitámbar* in Sanskrit as well as in modern languages. The word *pitmánbar* merely means a yellow cloth, and the probability is that this fabric was always yellow when it was first introduced, and although it is now dyed red, green, purple, orange or black, it still retains its first name, derived in all probability from the natural yellow colour of the *Bombyx mori* silk. Vishnu is called "*Pitambar-dhári*" in mythological books. This name literally means "one who bears a yellow cloth."

103. Green satin with diamond-shaped spots of crimson, with yellow and crimson rings,

white, red and yellow spots produced by bandhana work. The border is red, with white and yellow spots. The larger spots in the centre of the piece are diamond shaped, and composed of concentric crimson and yellow quadrangles. From Porebandar, Bombay.

104. Embroidered *chadar*, with green, purple and orange scrolls, surrounding large red discs representing the full moon. From Shikarpur in Sind, Bombay.

105. Black silk with fine gold border. From Poona, Bombay. Used for bodices.

106. *Shela*, scarf with gold brocade. A very interesting and ornate example of gold weaving The ends bearing very broad gold bands denotes that it is for a woman. From Poona, Bombay.

106*a*. Red silk bodice or pitámbar, a loin piece, gold border. Poona, Bombay.

106*b*. The description of No. 102 applies to this, with the exception that 106*b* is yellow on both sides. Border, gold on red silk ground. The joining of red and yellow weft at the border line is interesting, as the yellow weft does not go further across than the yellow centre. Poona, Bombay.

These two examples 106*a*, and 106*b*, were manufactured in Poona, under the supervision of Mr. E. C. Ozanne, Director of Agriculture, Bombay Presidency, to illustrate native dyes and the types of Poona weaving.

107. Bandhana silk. From Cutch, Bombay. Orange and pink dotted zigzag lines on black ground with red spots.

108. Bodice piece. A very interesting example of decoration. The border has a deep crimson ground, with double rows or bars of white flowers between green and gold coloured lines. The middle part of the cloth is another example of spots arranged in diamond shapes enclosed in yellow squares. Belgaum, Bombay.

109. Embroidered petticoat in yellow, white, and green. Shikarpur, Sind, Bombay.

110. Boy's scarf; purple, with red, green, and yellow border. Shikarpur.

111. Silk scarf (*lungi*), in red, white, and green design, with gold thread, crimson ground. Tatta, Sind, Bombay.

PUNJAB.

112. A dress trimming of English-made net embroidered in Delhi. A fine bold scroll design of flowers and stems worked in undyed but cleaned Bokhara silk floss. A characteristic and good example of the Delhi style of embroidery.

113. Yellow and red shot silk. From Delhi, Punjab.

114. A very large piece of silk embroidery. It is a ceiling cover, and is called Hindi Chandani. From Multan, Punjab.

115. Striped silk, in dull red, gold, and white. From the Punjab.

116. Grey silk. From Lahore, Punjab.

117. Purple piece of silk. From Lahore, Punjab.

118. Green silk piece with white lines. From Lahore, Punjab.

119. Orange and red shot silk piece. From Delhi, Punjab.

120. Crimson silk piece with yellow border. From Lahore, Punjab.

121. Dark grey piece of silk. From Lahore.

122. Light green piece of silk, red border. From Lahore.

123. Red piece of silk, yellow border. From Lahore.

124. Orange piece of silk, red border. From Lahore

125. Blue and yellow shot silk, yellow border. From Lahore.

126. Purple piece of silk. From Lahore

127. Black and orange shot silk piece. The characteristic of these Lahore silk pieces is their stiff and velvety feel. From Lahore.

128. Man's garment, *lungi*, white with red squares. From Jhelum, Punjab.

129. Salmon-coloured piece of silk. From Lahore.

130. Green and red shot silk piece. From Lahore. A very handsome silk.

131. Red silk piece with white vertical lines. From Amritzur, Punjab.

132. Green silk piece with red lines. From Lahore.

133. Gold coloured and red silk piece worked in serrated bands. From Lahore.

134. A fine Cashmere woollen shawl with embroidered borders of undyed cleaned white silk. Elaborately worked.

135. Blue, yellow, and white printed silk. This has an interesting white scroll pattern on a large scale running over the yellow and black design, which is very peculiar and effective. I bought it in Peshawar, but I think it is probably a Bokhara print.

136. *Sozni* or bed-cover embroidered with silk upon cotton. This remarkably fine piece of embroidery was probably worked away from Peshawar, possibly in Bokhara, although such examples are now made there. The bold treatment of masses of reds, blue, green and yellow are effective, and the design generally denotes a breadth of conception not usual in embroidery. Crimson and scarlet are freely introduced side by side.

137. Black, yellow, and white printed silk, similar to No. 135. Peshawar.

138. Embroidered Sozni or large square silk embroidery, with red and gold coloured silk worked upon a Chinese silk patterned fabric. This is probably the finest sozni exhibited. It is a valuable old piece, with beautifully dyed colours. In possession of Her Majesty the

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Queen Empress. It has been well reproduced as an illustration, by chromolithography, by Mr. Griggs in the Journal of Indian Art. It is quite possible this came from Bokhara, although Soznis are now being worked at Peshawar, where I found it.

139. Blue, yellow, and white printed silk, like No. 135. From Peshawar.

140. A very handsome green, yellow, red, and purple plaid. From Peshawar.

141. Silk embroidered *Sozni* Probably a prayer carpet, as it is embroidered only on the sides, with a plain centre. On a very large scale, like No. 136, the description of which will apply to this. From Peshawar.

142. Embroidered sheepskin overcoat. Lent by Mr. Wardle. The sheepskin is richly embroidered all over in a good design, with gold coloured floss. The wool has not been removed, but forms the interior of the coat. It is worn by military Afghans and others, and is called a postin. It was probably embroidered in Kabul, though I bought it in Peshawar.

143. Printed gauze, in crimson, black, green, and yellow. Bought at Peshawar.

NORTH-WESTERN PROVINCES.

144. A cushion-cover, and a pure example of the Kinkhab weaving of Benares in gold on black silk.

145. A similar Cushion Cover to No. 144, but in gold upon white silk.

146. Gold embroidered black silk cap. From Benares.

147. Gold on coral-coloured silk Kinkhab. Mohor pattern. From Benares.

148. A costly coat of silk cloth richly embroidered with gold. From Benares.

149. Kinkhab, in transverse bands on dark blue silk. An elaborate pattern. From Benares.

150. Kinkhab Turban, most richly woven with gold borders and ends, and very beautiful. From Benares.

BENGAL.

151. *Baluchar Sari.* White brocade on purple ground. Berhampur, Bengal.

152. *Baluchar Sari.* Yellow, white and red silk brocade on green ground. Berhampur, Bengal.

153. *Baluchar Sari.* White and red silk brocade on purple ground. Berhampur, Bengal.

154. *Baluchar Sari.* Orange silk brocade on purple ground, with white and red border, and orange, white and green ends. Berhampur, Bengal.

155. *Baluchar Sari.* Figured brocade in white, red, and yellow on purple ground. Berhampur, Bengal.

156. *Baluchar Sari.* White silk brocade on blue ground, with white and red border. Berhampur, Bengal.

157. *Baluchar Sari.* Orange silk brocade on purple ground, with red, orange, green and white borders and ends.

158. *Baluchar Sari.* Red brocade on red ground, with yellow, green and blue border. Berhampur, Bengal.

159. Man's garment, black, with red, yellow and green bands at the ends. Kagra, Bengal.

151 to 159 are good examples of Berhampur weaving in Saris or women's scarfs; borders most elaborate; with figure weaving of both Hindoo and English subjects. The English subjects are both naval and military. The colouring is very rich, and generally too pronounced for European taste. The borders are all interesting.

160. Purple-shot silk piece. Bankura, Bengal.

161. Black, red, blue and white silk plaid. Murshidabad, Bengal.

162. Purple and buff silk plaid. Murshidabad, Bengal.

163. White and black silk plaid. Bhagalpur, Bengal.

164. White and purple silk plaid. Murshidabad, Bengal.

165. Pink, white and black silk plaid. Murshidabad, Bengal.

166. Purple and white silk plaid. Murshidabad, Bengal.

161 to 166 are an interesting variety of well-thought out forms.

BOKHARA.

166*a*. A curious piece of very narrow silk velvet or plush-like fabric, in conventional carpet design, in green, purple, red, yellow, and cream colour. Bokhara.

Pile-cut fabrics are rare in the East. I have not met with any silk velvets in India of native make.

RAJPUTANA.

166*b*. Old Chenille from Jaipur. Twelve pieces, mats, slippers, boxes and tassels. Well worth examination for bright, effective colouring, design and excellence of dyeing in reds, gold colour, black, green, blue and white.

166*c*. Green velvet bag, embroidered with gold. Jaipur.

166*d*. Purple velvet bag, embroidered with silver. Jaipur.

166*e*. Elaborate specimen of "tie-and-dye" or Bandhana work. Lent by Dewan Sree Ram, Prime Minister of Ulwar.

166*f*. Bi-coloured net. A marriage robe, most curiously dyed red on one side and green on the other. Ornamented with crescents of alternate red and green set off in gold thread embroidered bordering. Ulwar.

166*g*. Gujrati bandhana or "tie-and-dye" work, in spots and borders of four colours. Partly tied. Ulwar.

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BENGAL.

167. Tussur silk dress, embroidered with cotton. Hugli, Calcutta.

168. *Charkhona* cloth with white and black squares in the design. (*Chár* means four, and *Khona*, angles.) Bhagalpur, Bengal.

NORTH-WESTERN PROVINCES.

169. *Lungi.* Man's garment with green and yellow zigzag lines and red stripes. Azamgarh, North-Western Provinces.

BENGAL.

170. Tussur silk dress, skirt and bodice, embroidered with Tussur silk. Hugli, Calcutta.

NORTH-WESTERN PROVINCES.

171. Yellow silk and cotton cloth. Azamgarh, North-Western Provinces.

BENGAL.

172. Red silk cloth. Kagra, Bengal.

173. Orange silk cloth, with pretty border. Bought at Calcutta, probably made at Giridi.

174. Satin *mashru*, in white, yellow, black and red bands. Bankura, Bengal.

175. Printed silk handkerchief, black and red on orange ground. Bought at Calcutta.

176. Woman's garment. Bankura, Bengal.

NORTH-WESTERN PROVINCES.

177, 177*a*, 178. Lungis. Men's garments. Azamgarh, North-Western Provinces.

BENGAL.

179. Blue printed silk handkerchief. Calcutta.

180. Printed priest cloth worn by the Vaishnavites, red on orange ground with the footprints of Vishnu, the Protector, and the lotus-shaped symbol of the throne of his wife Lakshmi, the Goddess of Wealth. In the square panels is given the following prayer, which is a repetition of the names of Vishnu in his seventh and eighth incarnations *Ram* and *Krishna*.

"*Hare Rám Hare Rám Ram Ram Hare Hare.*"

"*Hare Krishna Hare Krishna Krishna Krishna Hare Hare.*"

Hare, Krishna and Ram are the names of Vishnu, and they are repeated hundreds of times in the course of the day, the rosary being used for counting the number in hundreds. As a rule 108 beads are strung together to allow a sufficient margin for miscalculation through oversight. It is made of the *rudráksha*, *Elæodendron* seeds or of the wood of *tulsi*, the sacred *Ocymum*.

A priest—Brahman—wears this cloth after bathing during the time he performs his ceremonial worship to his gods and says his *sandhia* or sacred prayer. From Calcutta.

181. Woman's garment, woven in pattern. Bankura, Bengal.

182. Printed silk handkerchief. Calcutta.

183. Printed silk handkerchief. Calcutta.

184. Printed silk handkerchief. Calcutta.

185. Printed silk handkerchief, red on orange ground. Calcutta.

186. Printed silk handkerchief, red and black on orange ground. Calcutta.

187. Printed silk handkerchief, red and black on buff ground. Calcutta.

188. Printed silk handkerchief, red and black on orange ground. Calcutta.

189. Printed silk handkerchief, red and black on yellow ground. Calcutta.

190. Printed silk handkerchief, red and black on orange ground. Calcutta.

191. Printed silk handkerchief, red and black on yellow ground. Calcutta.

192. Printed silk handkerchief, red and blue on yellow ground. Calcutta.

193. Printed silk handkerchief, red on orange ground. Calcutta.

194. Printed silk handkerchief, red and black on orange ground. Calcutta.

195. Printed silk handkerchief, red and black on orange ground. Calcutta.

196. Printed silk handkerchief, red and black on buff ground. Calcutta.

197. Case of exhibits showing the improved reeling of Tussur silk and its appliances. By Mr. T. F. Peppé, Arrah, Bengal. Consisting of Tussur cocoons with pedicles, pierced Tussur cocoons, pedicles of Tussur cocoons softened and prepared for carding, Tussur cocoons prepared for reeling, Tussur raw silk, Tussur silk waste, woven Tussur silk fabrics, Tussur silk lace made at Madras, waist bands, fichus, embroidery, yarns for sewing and stocking-knitting, singlets, socks, &c. London Agents—Tongue & Birkbeck, 34 Southampton Buildings, Chancery Lane, London, W.C.

198. Case containing recent improvements in reeling Tussur silk by various firms in India.

a. By Mr. James Cleghorn, Akra, Calcutta.

b. By C. W. Marshall, Esq., Bengal Silk Company, Berhampur, Bengal.

MADRAS.

c. By the Mylitta Silk Mills Company, Madras, working by a new process invented by Messrs. Ernest Donner and Eugene Corsel.

PUNJAB.

d. By Tubhan Mallik Hashmiri. Exhibited by W. Coldstream, B.C.S. Grown and reeled in the Gurdaspur District.

BENGAL.

e. By Messrs. G. Gauthier & Co., Hazaribagh, Bengal.

f. By Messrs. Louis Payen & Co., Berhampur, Bengal.

199. *Charkana bufta.* Cotton and silk. From Fatwa, Bengal.

200. Tussur marriage *sari*, dyed. Fatwa, Bengal.

201. *Ladhia Charkana bufta.* From Fatwa, Bengal.

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202. *Charkana bufta.* From Fatwa, Bengal.
203. *Doaria bufta.* From Fatwa, Bengal.
204. *Istrap bufta.* From Fatwa, Bengal.

NEPAL.

205. Rare piece of undyed silk cloth woven from the silk of the cocoons of the Atlas silkworm, *Attacus Atlas* in the Nepal Terai by the Mechi people. The warp and weft are spun yarns of long staple. Specially manufactured for this Exhibition and sent by Mr. Phelps.

Owing to the oppression the original manufacturers of this cloth have had to undergo, at the hand of the Nepalese Authority, they have been driven from that part of the country bordering on the Mechi, and are now settling on land across the Teesta.

205*a*. Cloth made from the silk of the Atlas silkworm, like No. 205. Dyed red. Nepal Terai.

205*b*. Cloth of the silk of the Atlas silkworm, like Nos. 205 and 205*a*, woven in pattern in red and yellow. Native weaving and dyes. Nepal Terai.

BENGAL.

206. Cloth woven in squares and embroidered in floral design with the silk of the Muga silkworm, *Antheræa Assama*. Dacca, Bengal.

207. *Dupata* or turban, embroidered at Dacca, Bengal.

ASSAM.

208. Scarf of Muga silk, with nice border in red, white, gold colour and gold thread. Assam.

BENGAL.

209. Muga silk (*Antheræa Assama*) and cotton fabric. *Bufta.* From Dacca, Bengal.

210. *Dupata* or turban, embroidered at Dacca, Bengal.

211. Muga silk (*Antheræa Assama*) embroidery. Dacca, Bengal.

ASSAM.

212. Muga silk (*Antheræa Assama*) gauze scarf. Assam.

BENGAL.

213. Muga silk (*Antheræa Assama*) embroidery, green, red and gold colour. Dacca, Bengal.

MANIPUR.

214. Silk dress with stripes and interesting border in red, black, gold colour and white. Manipur.

215. Woman's dress, interesting border, principally gold colour. Manipur.

216. Silk and cotton dress, very nicely designed border, principally green. Manipur.

Nos. 214, 215 and 216 are three typical designs of this district. They have been lent by Dr. Watt, C.I.E.

BENGAL.

217. Corah silk for handkerchiefs and *Saris*, cleaned and of excellent quality. Made at Berhampur, Bengal.

218. Gown piece of Corah silk. Berhampur, Bengal.

219. Corah silk, "in gum," or not boiled-off or cleaned.

The word "corah" means "raw," and these silks are all woven in the raw or uncleaned state, as the natural golden colour of this piece shows. The creamy white colour of the cleaned pieces is due to the silk being boiled in water, to which *saji mati* has been added, which dissolves the natural gum from the fibre.

220. Plain Corah silk, ordinary quality.

221. Corah silk of good quality, embroidered in "*chicken*" work at Hugli, Calcutta. From Berhampur, Bengal.

222. White silk *Dhoti*. Murshidabad, Bengal.

223. Piece of Corah cloth. Murshidabad, Bengal.

224. Silk handkerchief. Berhampur, Bengal.

225. Silk handkerchief. Berhampur, Bengal.

226. Thick Tussur silk cloth. Murshidabad, Bengal.

228. Tussur silk *Dhoti*. Giridi.

229 and **230.** Tussur silk fabrics. Bankura, Bengal.

231. Tussur silk fabric. Giridi.

232. Yellow chuddur. Giridi.

233. Dyed Tussur silk fabric. Giridi.

234. Tussur silk dress embroidered with Tussur silk. Hugli, Calcutta.

ASSAM.

235. Silk fabric with deep border woven in stripes, purple centre. Sibgunge, Assam.

236. Silk fabric. Interesting colouring, red and dark blue, with elephant woven in border. Very singular weaving. Sibgunge, Assam.

237. Silk fabric, red centre and gold-coloured border, primitive. Sibgunge, Assam.

MISCELLANEOUS.

238. Leek Tussur embroidery, worked by a young Hindoo widow in the Wesleyan Training Institution, Royapettah, Madras. Lent by J. Wilcox Edge, Esq., Burslem.

239. Handloom, such as has been used for centuries at Benares, in which is woven the sacred ribbon exhibited below it. Lent by Mr. Wardle. This small handloom is used by probably not more than three weavers, who sit in niches in the streets of Benares near the temples weaving the sacred ribbon exhibited below. This ingenious and very curious little loom evidently foreshadowed the application of cards in the Jacquard loom. In this case the cards are little squares of horn, each having four perforations through which four of the warp threads pass and are guided at will to help in forming the intricate pattern. There are in all forty-six horns, indicating 184 warp threads.

Colours of warp green, white and crimson.

Colour of weft crimson, which is knocked up by a small knife-shaped hand-beam.

Length of loom	.	4 ft. 4 in.
Height „	.	9 in.
Breadth „	.	2¼ in.

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It is made of wood, and consists only of a base of a carved piece of teak wood, having an upright peg at each end round which the warp is wound at one end and the woven tape attached at the other.

The only harness is a wooden comb, six inches in length, having 72 teeth, which holds the warp threads sufficiently apart for the horns which are 1½ in. square to be worked.

240. Sacred Ribbon or Tape woven at Benares in the little loom exhibited above it. It contains, in ornamental borders, twenty-nine names of Vishnu in Sanscrit. They are, when rendered into English characters, as follows:

1. Shri Krishnáyanamha
   Shri Gopijanvallabháyanamha
2. Shri Krishna sharol namaha
   Shri Achâryaji namaha
   Prabhu shri Gosáiji
3. Shri Vithal náthji
   Shri Girdharji
   Shri Govindji
4. Shri Bálkrishnaji
   Shri Gokulnáthji
   Shri Raghunáthji
   Shri Yadunáthji
5. Shri Ghannashyámji
   Shri Dámodarji
6. Shri Govardhanannáthji
   Shri Navanita-priyaji
   Shri Madan Mohanji
7. Shri Vithaleshvarayaji
   Shri Dvárkánáthji
   Shri Gokulnáthji
   Shri Garudhvajaji
8. Shri Gokul chandramáji
   Shri Mathuránáthji
   Shri Natavarji
9. Shri Bálkrishnaji
   Shri Gokulodhavji
   Shri Baladevji
10. Shri Náthji
    Shri Jamunáji

All these names of Vishnu are written in Sanscrit, some of them having Gujrati terminations. *Shri* means "the beautiful."

Another tape below is intended for Shiva worshippers, and contains only a repetition of *Om Namha Shivâya*, "I bow to Shiva."

These tapes are worn at worship in the Hindoo temples, and at home. Lent by Mr. Wardle.

241. Silk formed by the spider *Nephilengys malabarensis*, Walck., found at the Lake of Bhím Tál, in Kumáun District, North-Western Provinces, by J. F. Duthie, Esq., of the Botanical Gardens, Saharanpur, showing the way in which it was collected on sticks.

242. The same spider-silk as the preceding No., but removed from the sticks. (For information on this silk, see my report of "Researches on Silk Fibre," published by the Government of India, July 9, 1885.)

243. Larvæ, in alcohol, of *Bombyx mori. B. fortunatus*, Wood Mason. Government of India. (Pl. III., Fig. 3.)

244. Larvæ of *Bombyx mori* of larger size No. 243. Government of India.

245. Larvæ of *Antheræa mylitta*, or Tussur silkworms, collected by myself from he *Terminalia tomentosa*, or Saj tree, in the garden of the Rev. A. Campbell, situated in the forest jungles of Manbhum, at Pokhuria, Gobindpur, Bengal. In this jungle district Tussur cocoons are bred and collected by the Santal and Kohl tribes. These caterpillars, when living, were about five inches long, and were of the beautiful pale green colour of the leaves of the Saj tree, and it was consequently very difficult to find them. (Pl. IV.)

246. Larvæ of *Attacus ricini*, which make the Eri silk of Assam. They feed on the leaves of the *Ricinus communis*, or castor-oil plant.

247. Larvæ and Chrysalides of *Cricula trifenestrata*. They feed and make their cocoons in colonies or cluster-bunches, and are found in some parts of Chutia Nagpur in considerable quantity, hanging from the branches of the trees in clusters or bunches like grapes.

248. Silk and cocoons of the mulberry-fed silkworm from Cyprus. These cocoons are remarkably large and the silk good.

249. Sewing silks made from Bengal silk and dyed with Indian dyes. Manufactured from Bengal raw silk by Mr. S. Gibson, Jr., Leek, as is also No. 250.

250. Boiled-off Sewing Silks, showing the excellent quality which the improved reeling of Bengal silk will make.

251. White Silk Handkerchief made entirely with Bengal silk of the improved reeling. This and Nos. 252 to 257 were manufactured by Mr. J. O. Nicholson, Macclesfield.

252. Silk Handkerchief made with well reeled Bengal silk weft, and China silk warp, dyed.

253. Tram made of Bengal silk of the improved reeling. Now in the market.

254. Organzine made of Bengal silk of the improved reeling. Now in the market.

255. Laturi, with boiled Eria cocoons, showing the method of spinning Eria silk in Assam.

256. Takuri, with Eria-spun thread from the Laturi.

257. Laturi, large size, and Takuri, such as are used in spinning Eria silk thread in Assam.

258. Laturi, as used at Ranchi for spinning Tussur silk cord.

259. Bengal Raw Silk reeled with the Tavelette Consono in India. Very fine quality.

260. Tram made of similar raw silk to the preceding No. Thrown by Messrs. George Davenport & Co., Leek.

261. Organzine made of similar raw silk to No. 259.

262. Bara-poloo Silk, 23 deniers. A white univoltine silk, superior either to the Chhotopoloo or the Nistry silks. Unfortunately it is dying out of Bengal.

DECCAN.

263. *Chakmak*, made of bamboo, with caps of portions of Tussur cocoons, used in obtaining a light for smoking. Deccan.

264. Tussur cocoons with pedicles showing

the manner in which the larvæ attach their cocoons to the branches of the trees on which they feed, when they begin to form them.

265. Tussur cocoons softened and prepared for reeling.

266. Tussur cocoons of larvæ which feed on the wild plum tree, *Zizyphus jujuba*. These cocoons are much whiter in colour than those which feed on the Terminalias.

267. Cocoons of the Eria silkworm in masses or attached bunches. Nowgong, Assam.

268. Embroidery floss silk, such as is used in Calcutta, Native dyes.

269. The quantities or lengths of raw silk obtained from various cocoons.

(*a*) Italian White Cocoons, old Italian breed, 725 metres; (*b*) Italian Yellow Cocoons, old Italian breed, 725 metres; (*c*) Bengal Cocoons, Desi worm, 200 metres, very good; (*d*) Bengal Cocoons, Desi worm, 160 metres.

AIDS TO SERICULTURAL STUDY.

270. Aids to sericultural study, consisting of cocoons of thirty-eight varieties of the mulberry-fed silkworm, *Bombyx mori*, other than those of Bengal.

These cocoons are from Mr. Wardle's private collection, and are exhibited here for the purpose of study and comparison with the cocoons of India.

a. Japanese cocoons, Aka-Tiku.
b. „ „ Ao-Jiku.
c. „ „ Ko-ischi-Maru.
d. „ „ Mata-Mukashi.
e. „ „ Oui-tchi-Zimi.
f. „ „ Timé San.
g. „ „ Kin Sei.
h. „ „ Ki mai san.
i. „ „ Nikiva San.
j. „ „ Shi-Kiva-San.
n. Cocoons from Kalamata, Greece.
p. French cocoons, large variety.
q. „ „ Bione variety.
r. „ „ Vallerangue.
s. „ „ des Cevennes.
t. „ „ Alpes Maritimes.
u. „ „ de Provence.
v. „ „ de Sina.
w. Italian cocoons, Sardinia.
x. „ „ Tuscany.
y. „ „ Pestellini.
z. Bulgarian cocoons, Roustchouk.
aa. Cocoons from Andros, Greece, Vitaliste.
bb. „ „ Bagdad, Turkey in Asia.
cc. White cocoons of Corea, raised in France.
ee. „ „ from Cochin China.
ff. Yellow cocoons, Piedmont.
gg. „ „ „
hh. White Brianza cocoons, Lombardy.
ii. Green cocoons.
jj. Italian cocoons injured by Camelo beetle.
kk. White Italian cocoons from Japanese eggs.
ll. Yellow cocoons, Milan.
mm. Green Italian cocoons from Japanese eggs.
nn. White cocoons, Milan.
oo. Yellow cocoons, Brianza, Lombardy.

271. Silk; Corah, *i.e.*, cloth woven "in-gum" cloth, made from Madrassee cocoons, Sibgunge.

272. Silk; Corah, *i.e.*, ungummed cloth, made from *Desi* cocoons, Sibgunge.

272 *a*. Raw Silk and Cocoons from the "Lister Grant" Dehra Dun, North-Western Provinces, from French eggs. *See* also Cocoons, 382*a*.

273. Banjetty silk, 16 to 20 deniers, Bengal Silk Company, Berhampur.

Banjetty is the name of one of the factories or filatures of this company.

274. "Pat" silk, *Bombyx textor*, Assam.

275. Stages in the manufacture of Indian gold thread for embroidery and weaving. Sent by E. C. Ozanne, Esq., Director of Agriculture, Bombay Presidency.

a. Silver bar, covered with gold leaf.
b. Thin wire drawn out from the gold leaf covered bar.
c. Finer drawn wire of gold on silver.
d. This is the finer wire flattened by the hammer.
e. China silk thread dyed orange to be covered with the gold and silver wire.
f. Gold thread, consisting of *d* and *e* wound together, for weaving, and embroidery. Its perfected state.

276. Phalki or reel used in India for winding raw silk. (Pl. XLII.)

277. Silk hand reel from Madras, upon which the raw silk is wound from the Phalki. (Pl. XLII.)

278. Tavelette-Consono, as generally used in reeling silk in Italy. (Pl. I.)

This is the tavelette now coming into use in some of the filatures in Bengal, and by which a great improvement in the reeling of Bengal cocoons is effected.

279. Tavelette, showing the method of reeling in the European filatures in Bengal up to the present time.

282. Eleven *kharita* bags, some with seals, obtained from the Foreign Office by Major-General Sir John Watson, V.C., K.C.B.

"*Kharita*" means a letter from a prince, and these bags are used as envelopes by the princes of India. They are beautifully woven in silk, gold and silver.

European Utilizations of Tussur Silk.

283 to 288. Undyed Tussur silk damask, patterned, made from Tussur silk of improved reeling. English and French. Government of India.

289. Undyed Tussur silk damask (with red and blue spots of mulberry silk) made from Tussur silk of improved reeling. Government of India.

290. Tassel and cord made of Tussur silk.

291. Twelve pom-poms of Tussur silk, for millinery purposes. Made by Messrs. Yeomans & Son, London.

292. A facsimile reproduction of a border of very beautiful Italian Florentine embroidery, in Tussur silk floss on Tussur silk cloth, by the

Leek Embroidery Society, from an old piece found in Florence, and lent to this society by Professor Church, of very beautiful design and harmony of colour.

The methods by which the colours of the original were dyed have been re-discovered by Mr. Wardle and applied to the Tussur silk reproduction.

293. Tussur silk fringe in different shades of blue and white.

294. Tussur silk fringe in various colours.

294*a*. Toy chenille dog made of Tussur silk.

294*b*. Toy chenille monkey made of Tussur silk and holding Tussur cocoon.

295. Tussur silk chenille work for upholstery.

295*a*. Tussur patterned cloth, partly dyed.

296. Tussur silk patterned cloth woven in Lyons.

297 to 304. Tussur silk fichus, undyed.

305. Tussur silk fringe, undyed.

306. Tussur silk cloth, partly printed and partly painted by hand.

Leek Embroidery. (Pl. XXXIX.)

307. Case of twenty-two pieces of native woven Tussur silk embroidered upon with Tussur embroidery silk manufactured in England from Indian Tussur cocoons, and dyed by Mr. Wardle with Indian vegetable dyes in permanent colours. Worked and lent by the Leek Embroidery Society, Leek, directed by Mrs. Wardle. 307*a* to 307*t* as follows:—

307*a*. A large design consisting chiefly of birds, pomegranates, lotus flowers and gracefully treated stems, adapted from one of the beautiful fresco borders in the Ajanta caves, Ajanta or Indhyádri hills, Nizam's Dominions, by C. Purdon Clarke, Esq., C.I.E. This pattern is known as the "Ajanta" pattern. It is here worked in reds, greens and greys of lowish tone, with a free use of gold thread. The colouring of this and the whole of these specimens is by Mrs. Wardle.

307*b*. A Damascus design adapted by C. Purdon Clarke, Esq., C.I.E., and coloured by Mrs. Wardle.

307*c*. A Floral border of English design.

307*d*. A Floral border " "

307*e*. A Floral border, Indian design.

307*f*. " " " "

307*g*. A Floral border, with effective herringbone work, Indian design.

307*h*. A Floral border, Indian design.

307*i*. " " " "

307*j*. " " " "

307*k*. " " " "

307*l*. An Indian design of flowers and interlacing stems in pale shades with gold thread.

307*m*. An old Burgundian design in reds and greens.

307*n*. A Cushion worked in the same design as 307*m* in greens and blues.

307*o*. Satin Bag worked in pale colours.

307*p*. Plush Bag worked in dark colours.

307*q*. Trimmings for a dress worked in pale shades and untarnishable gold thread.

307*r*. Trimmings for a dress worked in deeper shades.

307*s*. Trimmings for a dress worked in gold colour, yellows and gold thread.

307*t*. A Pulpit Hanging in green, blue and gold.

308. "Seal cloth" made in Yorkshire from Tussur silk waste with insertions of white hairs added amongst it. Government of India.

309. Tussur silk cloth, figure woven, undyed. Government of India.

310. "Seal cloth" made in Yorkshire from Tussur silk waste. Government of India.

311. Tussur silk, striped fabric. Government of India.

312. Figured silk fabric, shot with Muga (*Antheræa Assama*) silk of Assam. First Muga silk of English manufacture. Woven in Leek. Lent by Mr. Wardle.

313 and 314. Tussur silk striped fabrics. Government of India.

Sikh Embroideries, etc.

315 to 320. Embroidered petticoats made and worn in Amritsar, Punjab, and the neighbouring villages. Government of India.

321. Embroidered phulcari petticoat made and worn in Amritsar and the neighbouring villages. Government of India.

322 to 325. Embroidered petticoats made and worn in Amritsar and the neighbouring villages. Government of India.

326. Very fine scarlet and yellow phulcari on black ground with very deep border, made and worn in Amritsar and the neighbouring villages. Lent by Sir George Birdwood, C.S.I., LL.D.

327 and 328. Embroidered phulcari petticoat made and worn in Amritsar and the neighbouring villages. Government of India.

329, 329*a* to 329*f*. Very interesting and ancient Indo-Persian figure weaving. 329 Exhibited by South Kensington Museum, Indian section.

These Indo-Persian fabrics are woven in the following manner:—

A main warp forms the black satin ground and rises to allow the weft to come to the face to make the pattern.

A binder warp works simply to fasten the weft figure on the face, and the coloured weft on the back of the cloth. This is almost the oldest method of figure weaving, and not confined to any particular country. It occurs in Japanese and Chinese work, and in many of the Palermitan and Lucca fabrics, particularly the gold brocades, and is also most used at the present day.

These fabrics resemble those which the French call Lampas, and which in England are wrongly termed Brocatelle.

They are not brocades, but are made by the process called lancé, the colours not being put in by independent shuttles, but shot straight from side to side, following each other more or less in bars.

The short and exact repeat of the pattern shows that the fabrics have been made in a modification of the draw loom.

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They are all silk, very heavy and expensive to make.

Probably the cloth before being cut was 18 in. to 21 in. wide.

330. Phulcari, embroidered with orange silk on black cotton ground, ornamented with circular pieces of looking-glass, 5 inches apart. Government of India.

331. A good example of a typical phulcari, with most beautiful border in excellent colouring of red and white flowers and gold coloured leaves and stems. The etymology of phulcari is phul, a flower, and cari, embroidery or work. Lent by Mr. Wardle.

332, 332*a* to 350. Embroidered phulcaries made and worn in Amritsar and the neighbouring villages. Government of India.

351. Piece of yellow silk with white spots, effected by the tie and dye or Bandana process.

INDUSTRIAL AND RAW PRODUCTS COLLECTION.
Government of India.

352. Cocoons of the Desi or Chota poloo silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund. Ovened, i.e., artificially dried. Surdah, Rajshahi, Bengal. Government of India. (See Plate II., Fig. 4.)

353. Cocoons of the Desi or Chota poloo silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund. Unovened, i.e., sun dried. Surdah, Rajshahi, Bengal. Government of India.

354. Cocoons of the Desi or Chota poloo silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund. Pierced by the exit of the moth. Surdah, Rajshahi, Bengal. Government of India.

355. Cocoons of the Madrassee or Nistri poloo silkworm of Bengal, *Bombyx cræsi*. Rainy and hot weather bund. Unovened, i.e., sun dried. Surdah, Rajshahi, Bengal. Government of India.

356. Cocoons of the Madrassee or Nistri poloo silkworm of Bengal, *Bombyx cræsi*. Rainy and hot weather bund. Ovened or artificially dried. Surdah, Rajshahi, Bengal. Government of India.

357. Cocoons of the Desi or Chota poloo silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund. Pierced by the exit of the moth and fly-blown by a dipterous parasite. Surdah, Rajshahi, Bengal. Government of India.

358. Cocoons of the Madrassee or Nistri poloo silkworm of Bengal, *Bombyx cræsi*. Rainy and hot weather bund. Ovened, i.e. artificially dried. Multivoltine, about eight crops a year. Surdah, Rajshahi, Bengal.

359. Hybrid between the cocoons of the Desi or Chota poloo silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund, and the cocoons of the Madrassee or Mistri poloo silkworm of Bengal, *Bombyx cræsi*. Rainy and hot weather bund. Surdah, Rajshahi, Bengal. Government of India.

360. Cocoons of the mulberry-fed silkworm. Starved or else spun in too cold weather. They contain only a small quantity of silk. Galampore, Bengal. Government of India.

361. "Ordinary" cocoons of the mulberry-fed silkworm. Berhampur, Bengal. Government of India.

362. "Prize" cocoons of the mulberry-fed silkworm. Berhampur, Bengal. Government of India.

363. Cocoons of the mulberry-fed silkworm. Maldah, Bengal. Government of India.

364. Cocoons of the mulberry-fed silkworm. Rangpur, Bengal. Government of India.

365. Cocoons of the mulberry-fed silkworm. Bogra District, Bengal. Government of India.

366. Cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Bogra District, Bengal. Government of India.

367. Cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Serampur, Bengal. Government of India.

368. Cocoons of the mulberry-fed silkworm, Unovened, i.e. sun-dried. Serampur, Bengal. Government of India.

369. White cocoons of the mulberry-fed silkworm, "Boropolu Morahkoah." Murshidabad, Bengal. Government of India.

370. White cocoons of the mulberry-fed silkworm, "Boropolu kachi koah." Murshidabad, Bengal. Government of India.

371. White cocoons of the mulberry-fed silkworm, "Boropolur lat." Pierced by the exit of the moth. Murshidabad, Bengal. Government of India.

372. Red cocoons of the mulberry-fed silkworm, "Chhotopolur lat." Pierced by the exit of the moth. Murshidabad, Bengal. Government of India.

373. Red cocoons of the mulberry-fed silkworm, "Chhotopolu Morah koah." Murshidabad, Bengal. Government of India.

374. Red cocoons of the mulberry-fed silkworm, "Chhotopolu kachi koah." Murshidabad, Bengal. Government of India.

375. Cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Birbhum, Bengal. Government of India.

376. Cocoons of the mulberry-fed silkworm. Birbhum, Bengal. Government of India.

377. Cocoons (*Kóa*) of the mulberry-fed silkworm which obtained a bronze medal at the Doom ran Exhibition 1885. Dinapur, Bengal. Government of India.

378. Cocoons of the mulberry-fed silkworm. Gaya, Bengal. Government of India.

379. Cocoons of the mulberry-fed silkworm, reared in the Sudder subdivision, Howrah, Bengal. Government of India.

380. Cocoons of the mulberry-fed silkworm. Dhantala, Bengal. Government of India.

381. Cocoons of the mulberry-fed silkworm. Prescribed in medicine at Cawnpore as an Aphrodisiac or nervine tonic. Government of India.

381*a*. Cocoons of the mulberry-fed silkworm. Prescribed in medicine at Cawnpore as an Aphrodisiac or nervine tonic, from Bombay, sent by Mr. E C. Ozanne.

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382. White and yellow cocoons of the mulberry-fed silkworm, reared from Japanese eggs. Lahore, Punjab. Government of India.

382a. Buff Cocoons of the *Bombyx mori*, from French eggs, reared at the "Lister Grant" Dehra Dun. North-Western Provinces.

383. Cocoons of the mulberry-fed silkworm. First crop, raised in February–March, 1884. Eggs received from Dehra Dun. Saharanpur, N.W. Provinces. Government of India.

384. Cocoons of the mulberry-fed silkworm. Second crop. Raised March–April, 1884. Seed raised in Saharanpur, N. W. Provinces, from crop of February–March, 1884. Saharanpur, N. W. Provinces. Government of India.

385. Cocoons of the mulberry-fed silkworm. Third crop. Raised April–May 1884. Seed raised in Saharanpur, N.W. Provinces from crop of March–April 1884. Saharanpur, N. W. Provinces. Government of India.

386. Cocoons of the mulberry-fed silkworm. Dehra Dun, N. W. Provinces. Government of India.

387. Cocoons of the mulberry-fed silkworm, *Bombyx meridionalis*. Coimbatore Jail, Madras. Government of India.

388. Yellow-buff cocoons of the mulberry-fed silkworm, *Bombyx meridionalis*. Cuddapah, Madras. Government of India. I think these Cocoons were wrongly labelled at Madras, and that they are *Bombyx mori*.

389. Cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Reared on the Retreat Estate, Yerkad, Madras, from seed received through the Government from Dehra Dun, N. W. Provinces. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys.

390. Cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Reared on the Retreat Estate, Yerkad, Madras, from Mysore silkworms. Exhibited by Deputy Surg.-Gen. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys.

391. Cocoons of the mulberry-fed silkworm. Kanara, Madras. Government of India.

392. White and yellow cocoons of the mulberry-fed silkworm. Pierced by the exit of the moth. Burma. Government of India.

392a. Green cocoons of *Bombyx mori*. From North Matale, Ceylon. Fifteen hundred feet above the sea level. This part of Ceylon has a rainfall of about 90 inches, and the average temperature is about 75° F. The eggs from which these cocoons are obtained were introduced into Ceylon about two years ago, and come from Japan. Exhibited by the Hon. J. L. Shand, Ceylon Court.

392b. White cocoons of *Bombyx mori*. From North Matale, Ceylon. Exhibited by the Hon. J. L. Shand, Ceylon Court.

393. Cocoons of the mulberry-fed silkworm. South Australia. Exhibited by Sir Samuel Davenport.

394. Tussur silk cocoons, "*Muga*." Singbhum, Bengal. Government of India. (Pl. V.)

395. Tussur silk cocoons, "*Daba*." Singbhum, Bengal. Government of India.

396. Tussur silk cocoons, "*Laria*." Singbhum, Bengal. Government of India.

397. Tussur silk cocoons, "*Bogai*." Singbhum, Bengal. Government of India.

398. Pierced Tussur silk cocoons, "*Bugoy*." Singbhum, Bengal. Government of India.

399. Pierced Tussur silk cocoons, "*Daba*." Chaibasa, Singbhum District, Bengal. Government of India.

400. Pierced Tussur silk cocoons, "*Laria*." Chaibasa, Singbhum District, Bengal. Government of India.

401. Tussur silk cocoons. Ranchi, Chutia Nagpur, Bengal. Government of India.

402. Tussur silk cocoons. Santal jungles, Manbhum, Bengal. Government of India.

403. Pierced Tussur silk cocoons. Santal jungles, Manbuhm, Bengal. Government of India.

404. Tussur silk cocoons. Birbhum, Bengal. Government of India.

405. Tussur silk cocoons. Bardwan, Bengal. Government of India.

406. Pierced Tussur silk cocoons. Bardwan, Bengal. Government of India.

407. Tussur silk cocoons. Darjiling, Bengal. Government of India.

408. Tussur silk cocoons. Ganjam District, Madras. Government of India.

409. Tussur silk cocoons. North Arcot, Madras. Government of India.

410. Tussur silk cocoons. Dudhi, Madras. Government of India.

411. Pierced Tussur silk cocoons. Retreat Estate, Yerkad, Madras. Government of India.

412. Tussur silk cocoons. Madras. Government of India.

413. Tussur silk cocoons. Cuddapah, Madras. Government of India.

414. Tussur silk cocoons. Phillaur, Punjab. Government of India.

415. Tussur silk cocoons. Beas, Punjab. Government of India.

416. Tussur silk cocoons. Gaya, Bengal. Government of India.

417. Tussur silk cocoons (very pale in colour). Royal Gardens, Baroda, Bombay. Government of India.

418. Weaver's quills of Tussur silk weft. Murshidabad, Bengal. Government of India. (Pl. XLII.)

419. Pedicles of Tussur silk cocoons, prepared for spinning by boiling. Manbhum, Bengal. Government of India.

420. Pedicles of Tussur silk cocoons, prepared for spinning. Government of India.

421 & 422. Belt and knife-rest used by the wood-cutters of the Kolaba District, Konkan Division, Bombay Presidency, with bells made of Tussur silk cocoons. Lent by J. Griffiths, Esq., Superintendent School of Art, Bombay.

423. Cocoons of the Eria silkworm, *Attacus ricini*. Kamrup, Assam. Government of India.

424. Cocoons of the Eria silkworm, *Attacus ricini*. Assam. Government of India.

425. Cocoons of the Eria silkworm, *Attacus ricini*. Rangpur, Bengal. Government of India.

426. Cocoons of the Eria silkworm, *Attacus*

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ricini. Lakhimpur, Assam. Government of India.

427. Red and white cocoons of the Eria silkworm, *Attacus ricini*. Sylhet, Assam. Government of India.

428. Cocoons of the Eria silkworm, *Attacus ricini*. Jalpaiguri, Bengal. Government of India.

429. Red cocoons of the Eria silkworm, *Attacus ricini*. Dinajpur, Bengal. Government of India.

430. Cocoons of the Eria silkworm, *Attacus ricini*, prepared for carding, as sold for manufacturing purposes. Nowgong, Assam. Government of India.

431. Cocoons of the Muga silkworm, *Antheræa Assama*, first quality. Sibsagar, Assam. Government of India. (Pl. VII., Fig. 2.)

432. Cocoons of the Muga silkworm, *Antheræa Assama*, second quality. Sibsagar, Assam. Government of India.

433. Cocoons of the Muga silkworm, *Antheræa Assama*, third quality. Sibsagar, Assam. Government of India.

434. Cocoons of *Cricula trifenestrata*. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys. (Pl. XIII.)

435. Cocoons of *Cricula trifenestrata* in cluster-bunches or colonies. Ranchi, Chutia Nagpur. Bengal.

436. Raw silk reeled from the cocoons of the mulberry-fed silkworm by the ordinary method. 12 to 14 cocoons reeled together, size 25/30 deniers. Surdah, Rajshahi, Bengal. Government of India.

437. Raw silk reeled from the cocoons of the mulberry-fed silkworm with Italian appliances. 12 to 14 cocoons reeled together, size 25/30 deniers. Surdah, Rajshahi, Bengal. Government of India.

438. Raw silk reeled from the cocoons of the mulberry-fed silkworm by the ordinary method. Rangpur, Bengal. Government of India.

439. Fine raw silk reeled from the cocoons of the mulberry-fed silkworm, Bogra, Bengal. Government of India.

440. Coarse raw silk reeled from the cocoons of the mulberry-fed silkworm, Bogra, Bengal. Government of India.

441. Raw silk reeled from the cocoons of the mulberry-fed silkworm, lowest quality, Rs. 8 per seer. Maldah, Bengal. Government of India.

442. Raw silk reeled from the cocoons of the mulberry-fed silkworm, middle quality, Rs. 10·8 per seer. Maldah, Bengal. Government of India.

443. Raw silk reeled from the cocoons of the mulberry-fed silkworm, Rs. 11 per seer. Maldah, Bengal. Government of India.

444. Raw silk reeled from the cocoons of the mulberry-fed silkworm, best quality, Rs. 12 per seer. Maldah, Bengal. Government of India.

445. Tram for weaving made from the silk of the mulberry-fed silkworm of Bengal. Jehanabad, Hugli District, Bengal. Government of India.

446. Raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Jangipur, Murshidabad District. Government of India.

447. Raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. G. G. McP. Cossimbazaar, 26/30 deniers.

448 & 449. Raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Birbhum, Bengal. Government of India.

450. Tape chassum or waste of the silk of the mulberry-fed silkworm of Bengal. Birbhum, Bengal. Bengal Silk Company.

451. Coarse waste silk of the mulberry-fed silkworm of Bengal. Canpore. Government of India.

452 to 456. Raw silk reeled from the cocoons of the mulberry fed silkworm. Surdah, Rajshahi, Bengal. Government of India.

457. Coarse raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Radhanagar, Bengal, Government of India.

458. Bharua or Tram thrown from raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dhantala, Bengal, Government of India.

459. Tana or Warp thrown from raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dhantala, Bengal, Government of India.

460. Raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dhantala, Bengal, Government of India.

461. Raw silk reeled from the cocoons of the mulberry-fed silkworm. Dehra Dun, N.W. Provinces. Government of India.

462. White raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dehra Dun, N. W. Provinces. The seed from which the cocoons were reared was received through the Madras Government. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys.

463. Yellow raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dehra Dun, N. W. Provinces. The seed from which the cocoons were reared was received through the Madras Government. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys.

464. Straw coloured raw silk reeled from the cocoons of the mulberry-fed silkworm of Bengal. Dehra Dun, N. W. Provinces. The seed from which the cocoons were reared was received through the Madras Government. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerkad, Shevaroys.

464*a*. Raw silk reeled from Ceylon green cocoons. See No. 392*a*.

464*b*. Raw silk reeled from Ceylon white cocoons. See No. 392*b*.

465. Native Indian hand-reel for reeling silk cocoons. Government of India.

466. Dyed floss silk (Phalian) in different colours. Rs. 11/12 ann. per seer. Davee Sahai Chumba Mull, Hall Street, Amritsar, Punjab.

467. Floss silk (Katha) imported from

Yerkad, Madras. Rs. 10/4 per seer. Davee Sahai Chumba Mull, Amritsar.

468. Tani silk from Cabul, cleaned. Rs. 16 per seer. Davee Sahai Chumba Mull, Amritsar.

469. Silk (Phalian) imported from Cubul, Rs. 8/4 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

470. Silk (Ghatar) imported from Bengal Rs. 8/8 per seer. Davee Sahai Chumba Mull· Amritsar, Punjab.

471. Silk (Vardham) imported from Bukhara. Rs. 12 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

472. Silk (Chappi) imported from Bengal. Rs. 10 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

473. Silk (Makhtul) imported from Bengal. Rs. 6 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

474. Silk (Sheesh Mehal) imported from China. Rs. 5/12 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

475. Silk (Phul) imported from China. Rs. 11 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

476. Silk warp (Tani) imported from Yerkad. Madras, price Rs. 12 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab. Government of India.

477. Silk dyed in different colours with aniline dyes (Vardhan). Rs. 18 per seer. Davee Sahai Chumba Mull, Amritsar, Punjab.

478 & 479. Raw silk of the mulberry-fed silkworm, Kanara, Bombay. Government of India.

480. Coarse raw silk of the mulberry-fed silkworm. Mysore. Government of India.

481. Raw silk of the mulberry-fed silkworm, reeled from cocoons raised from seed obtained locally. Mysore. Exhibited by Deputy Surg.-Genl. J. Shortt, M.D., F.L.S., F.Z.S., Yerhad, Shevaroys.

482. Rough silk of the mulberry-fed silkworm used for weaving bathing-clothes. Cuddapah, Madras. Government of India.

483. Raw silk reeled from the cocoons of the mulberry-fed silkworm. Cuddapah, Madras, Government of India.

484. Boiled-off silk warp from Koreyal, undyed. Sent by Collector of Coimbatore, Madras. Government of India.

485. Raw mulberry silk from Koreyal.
Sent by collector of Coimbatore, Madras. Government of India.

486. Boiled-off silk warp from Koreyal, native-dyed orange.
Sent by collector of Coimbatore, Madras. Government of India.

487. Boiled-off silk warp from Koreyal, native-dyed crimson.
Sent by collector of Coimbatore, Madras. Government of India.

488. Boiled-off silk warp from Koreyal, native-dyed yellow.
Sent by collector of Coimbatore, Madras. Government of India.

489. Boiled-off silk warp from Koreyal, native-dyed orange.
Sent by collector of Coimbatore, Madras. Government of India.

490. Boiled-off silk warp from Koreyal, native-dyed red.
Sent by collector of Coimbatore, Madras, Government of India.

491. Boiled-off silk warp from Koreyal, native-dyed black, with the seeds of *Semecarpus anacardium*.
Sent by collector of Coimbatore, Madras. Government of India.

492. Raw silk of the cocoons of the mulberry-fed silkworm. Tinnevelli, Madras. Government of India.

493. Fine silk of the cocoons of the mulberry-fed silkworm. Cuddapah, Madras. Government of India.

494. Raw silk of the cocoons of the mulberry-fed silkworm. Cuddapah, Madras. Government of India.

495. Raw silk of the cocoons of the mulberry-fed silkworm, after first cleaning. Cuddapah, Madras. Government of India.

496. Raw silk of the cocoons of the mulberry-fed silkworm. Dinapur, Bengal. Government of India.

497. Waste silk of the cocoons of the mulberry-fed silkworm. Stuffing of the bed of the Queen of Burma. Government of India.

498. Tussur silk dyed in Calcutta. Aniline dyes. Government of India.

499. Tussur silk dyed crimson, yellow and violet. Government of India.

500 & 501. Tussur weaving silk, showing the modern improvements in dyeing it. Dyed by Mr. Wardle.

502. Tussar weaving silk, bleached by the most improved process. By Mr. Wardle.

503. Silk cocoons in Colonies, Madagascar. Lent by Mr. Wardle.

505. Tussur silk thread. The Twenty-four Parganas, Bengal. Government of India.

506 & 507. Tussur raw silk, native reeling. Birbhum, Bengal. Government of India.

508. Tussur raw silk, native reeling. Fatwa, Bengal. Government of India.

509. Tussur silk waste. Fatwa, Bengal. Government of India.

510. Tussur silk thread. Bardwan, Bengal. Government of India.

511. Tussur raw silk reeled from "Dhaba" Tussur silk cocoons. Singbhum, Bengal. Government of India.

512. Tussur raw silk reeled from "Bogura" Tussur silk cocoons. Singbhum, Bengal. Government of India.

513. Tussur silk waste. No. 1. Manbhum, Bengal. Sent by T. F. Peppé, Esq.

514. Tussur silk waste. No. 2. Manbhum, Bengal. Sent by T. F. Peppé, Esq.

515. Tussur raw silk, reeled from "Bogoi" Tussur silk cocoons. Singbhum, Bengal. Government of India.

516. Tussur raw silk, reeled from "Laria"

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Tussar silk cocoons. Singbhum, Bengal. Government of India.

517. Tussur raw silk. Anandpur, Midnapur Bengal. Government of India.

518. Tussur silk waste. Anandpur, Midnapur, Bengal. Government of India.

519. Tussur raw silk. Baramba State. Orissa. Government of India.

520 & 520a. Tussur raw silk. Rajgram, Bankura. Government of India.

521. Tussur silk waste, (*a*) undyed, (*b*) dyed with magenta. Ranchi, Chutia Nagpur, Bengal. Government of India.

521a. Tussur silk cord, dyed with magenta. Ranchi, Chutia Nagpur, Bengal. Government of India.

522. Tussur raw silk. Midnapur, Bengal. Government of India.

523. Tussur silk of native reeling from Ramdera, near Dehri, Shahabad, Bengal, in the reeling of which castor oil and the alkaline earth, *saji matti*, are used. Sent by T. F. Peppé, Esq.

524. Tussur raw silk. Gaya, Bongal.

525. Dyed Tussur silk warp on hand-reel. Fatwa, Bengal. Government of India.

526. Stiffened Tussur silk warp on hand-reel. Fatwa, Bengal. Government of India.

527. Stiffened and unstiffened Tussur silk warp. Fatwa, Bengal. Government of India.

528. Silk of the Eri silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Lakhimpur, Assam. Government of India.

529. Native made Eria silk cloth. Assam. Government of India.

530. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Lakhimpur, Assam. Government of India.

531. Native made Eria silk cloth. Dinajpur, Bengal. Government of India.

532. Native made Eria silk cloth, embroidered. Lent by Mr. T. F. Peppé, Arrah, Bengal.

533. Warp and weft spun threads of Eria silk, *Attacus ricini*. Nowgong, Assam. Government of India.

534. Native made Eria silk cloth. Nowgong, Assam. Government of India.

535. Native made Eria silk cloth. Nowgong, Assam. Government of India.

536. Waste Eria silk, *Attacus ricini*. Assam. Government of India.

537. Endi cloth, made from the silk of *Attacus ricini*. Assam. Government of India.

538. Balls of waste Eria silk, *Attacus ricini*. Lakhimpur, Assam. Government of India.

539. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Lakhimpur, Assam. Government of India.

540. Ball of raw silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Lakhimpur, Assam. Government of India.

541 to 543. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Sylhet, Assam. Government of India.

544. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Dinajpur, Assam. Government of India.

545. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Kamrup, Assam. Government of India.

546. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Jalpaiguri, Bengal. Government of India.

547. Silk of the Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. (Good quality.) Assam. Government of India.

548. Silk of the Endi or Eria silkworm, *Attacus ricini*, spun for weaving into cloth. Not reeled. Rangpur, Bengal. Government of India.

549. Silk of the Muga silkworm, *Antheræa Assama*. Lakhimpur, Assam. Government of India.

550. Silk of the Muga silkworm, *Antheræa Assama*. Kamrup, Assam. Government of India.

551 & 552. Silk of Muga silkworm (Jutha Muga), *Antheræa Assama*. Lakhimpur, Assam. Government of India.

553. Cloth woven from the silk of the Muga silkworm, *Antheræa Assama*. Government of India.

554. Muga silk turban. Assam. Government of India.

555. Silk of the Muga silkworm, *Antheræa Assama*, spun from pierced cocoons, for weaving into cloth. Not reeled. Assam. Government of India.

556. Silk of the Muga silkworm, *Antheræa Assama*. Sibsagar, Assam. Government of India.

557. Patterned silk damask shot with Muga silk from Assam. Government of India.

558. Tussur moths and cocoons on *Lagerstræmia Indica*. Poona, Bombay. Lent by Lieut.-Col. Counmaker Westwood, Guildford, Surrey, late of Poona.

559. Bengal imperfect Native reeling of raw silk from white and yellow cocoons of the ordinary mulberry-fed silkworm. In the silk, portions of the cocoons will be seen to have been allowed to run up into the reeled hank.

560. Improvement effected in December 1885, in reeling Bengal cocoons with the Tavelette Consono, by Mr. Wardle, showing the high state of refinement of which Bengal silk is susceptible by proper reeling.

561. European yellow raw silk showing the highest standard of reeling attained in Italy. Placed here to show by comparison that the regularity and fineness of thread are quite equalled in Bengal silk when the cocoons are properly reeled.

562. Cocoons of the Desi or Chota polco silkworm of Bengal, *Bombyx fortunatus*. November or cold weather bund. Used for both the native reeled yellow silk (559), and for that showing the improvement (560).

563. Raw silk reeled at the Surdah Filature of Messrs. R. Watson & Co., Rajshahi, Bengal, with the Tavelette Consono, 25/30 deniers.

Surdah is the name of the head filature of this extensive company, which embraces other filatures in the district. The filatures of

Radnagore, of which the factory at Ghátál is the head, also belong to this company. Ghátál, writes Dr. Hunter, is a municipal town in the Midnapur District, situated on the Silai River near its junction with the Rúpnáráyan, containing a population of about sixteen thousand, nearly all of whom are Hindus. It is an important commercial town, trading in rice, silk, sugar, cotton cloth, &c.

564. Raw silk reeled by the best Indian method at the Surdah Filature of Messrs. R. Watson & Co., Rajshahi, Bengal. 10/11 deniers.

565. Raw silk reeled at the Surdah Filature of Messrs. R. Watson & Co., Rajshahi, Bengal, with the Tavelette Consono, 10/11 deniers.

566. Improved reeling of Tussur silk by Messrs. R. Watson & Co., Surdah Filature, Rajshahi, Bengal.

567. Cocoons from Messrs. R. Watson & Co., Surdah, Rajshahi, Bengal.

a. Cocoons of *Cricula trifenestrata.*

b. Cocoons of the Tussur silkworm.

c. Yellow and white cocoons of the mulberry-fed silkworm. Burma.

d. Desi pierced cocoons of the Mulberry-fed silkworm. November bund.

e. Madrassee or hot weather cocoons of the mulberry-fed silkworm, unovened, i.e. sun dried.

f. Madrassee or hot weather cocoons of the mulberry-fed silkworm, ovened, i.e. artificially dried.

g. Desi or November bund cocoons of the mulberry-fed silkworm, unovened, i.e. sun-dried.

h. Desi or November bund cocoons of the mulberry-fed silkworm, ovened, i.e. artificially dried.

568. Bengal silk waste, from Messrs. R. Watson & Co., Surdah, Rajshahi, Bengal.

569. Tussur silk waste, from Messrs. R. Watson & Co., Surdah, Rajshahi, Bengal.

The Calcutta Agents of this firm are Messrs. Jardine, Skinner & Co. The London Agents, Messrs. Matheson & Co., 3, Lombard Street.

570. Raw silks reeled in the usual Bengal method by the Bengal Silk Company, Behrempore, Bengal.

a. A series of hanks of raw silk, 10 to 13 deniers. Gonatea.

b. A series of hanks of raw silk, 26 to 30 deniers. Cossimbazaar.

c. A series of hanks of raw silk, 11 to 13 deniers. Rangamati.

d. A series of hanks of raw silk, 16 to 20 deniers. Benjeti.

The Manager of this company is Mr. J. W. Stocks of Berhampur, and the Calcutta Agents, Messrs. Lyall, Marshall & Co. The London Agents are Messrs. Anderson Brothers, 16 Philpot Lane, E.C.

571. Gujrati Tie-and-Dye or Bandana work, in various styles of stripes and plaids, effected entirely by tying and dyeing cloth for turbans successively in various ways. These turbans are very beautiful examples of an art for which Ulwar is celebrated, and which is there practised with the greatest ingenuity and patience.

A to C. Turbans produced in Ulwar by the Bandana process. Gold border.

D. Turban produced in Ulwar by the Bandana process, showing the method in which the cloth is tied ready for dyeing. Since the dyeing process it has been untied and partially unrolled.

E. Turban produced in Ulwar by the Bandana process, showing the method in which the cloth is tied ready for dyeing. Since the dyeing process it has been part untied and unrolled.

F. Turban with gold border partially untied.

572. Manchester printed turban sent to India as an imitation of Ulwar Bandana work.

573. Electricity applied to dyeing by Mr. Wardle.

A. shows the application of the galvanic current in printing. The cloth is prepared with a moist precipitate of prussiate of tin and placed on a platinum plate connected with the cathode or negative pole of the battery, and written upon with a platinum pencil connected with the anode or positive pole of the battery. The galvanic current develops the colour.

B is an example of indigo discharged by the galvanic current by the same arrangement as described in A. The cloth is first dyed blue with indigo and then prepared with bichromate of potash.

C is a similar example showing the chemical change which occurs.

D is the same as B, but with saffranine mixed with the solution of bichromate of potash.

E. The cloth is dyed with Munjeet (*Rubia manjista*), and the written part discharged by electrolysis of bichromate of potash with the galvanic pencil.

F is the same kind of indigo discharge as B, but with a pattern cut in platinum plate, connected with the battery, applied to the moist cloth, instead of the galvanic pencil.

G. Green cloth dyed with Indigo and Hursinghar flowers (*Nyctanthes arbortristis*), prepared with bichromate of potash and discharged instantaneously by writing upon it with the galvanic pencil.

H. The same as B, but with the application of a less powerful galvanic current.

I. The same as B, but with the poles reversed. The discharge is therefore at the back of the cloth and penetrates only slightly to the side exhibited.

574. Short-reeled spun native silk for Mutka cloth, boiled off. Jinkra, near Surdah Rajshahi, Bengal. Mutka cloth is woven undyed, and principally at Dacra, six miles from Surdah.

575. Short-reeled spun native silk for Mutka cloth, in gum. Jinkra, near Surdah Rajshahi, Bengal. Mutka cloth is woven undyed, and principally at Dacra, six miles from Surdah, but without the gum having been discharged.

576. Native implement for spinning silk for Mutka cloth. Dacra, near Surdah, Rajshahi Bengal.

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578, 578*a* to 578*f*. Seven large Tussur Silk Rugs. Government of India.

579. One small Tussur Silk Rug. Lent by Mr. Wardle.

580. Cocoon reeling machine furnished with the Tavelette Consono, and in daily operation reeling Bengal cocoons worked by a fileuse or cocoon-reeler from the South of France. (Pls. I., XXXVII. to XLI.)

581. Working model of a machine for reeling Indian Tussur silk cocoons, in daily operation, worked by an Indian boy, and furnished with the Tavelette Consono. Suitable for village and cottage reeling in India.

582. THE FIRST INSTALMENT FROM INDIA TOWARDS A COMPLETE ENTOMOLOGICAL COLLECTION ILLUSTRATIVE OF INDIAN SERICULTURE, BY F. WOOD-MASON, ESQ., ASSISTING SUPERINTENDENT OF THE INDIAN MUSEUM, CALCUTTA.

No. of Tray.	No. of Specimen.	Name and Nature of Specimen.	Locality.	Remarks.
I.	1, *a—j*	*Bombyx mori*, Linn. Cocoons from Indian eggs	Lahore, Panjáb.	
	2, *a—j*	*Bombyx mori*, Linn. Cocoons from Japanese eggs	Ditto.	
	3, *a—e*	*Bombyx* sp. Cocoons .	Kotnaina, Gurdaspur, Panjáb.	Rearer Subhan.
	4, *a—h*	*Bombyx* sp. Cocoons .	Ditto. . .	Ditto.
	5, *a—e*	*Bombyx textor*, Hutton. "Bara Poloo." Cocoons	Gonatea.	
	6, *a—c*	Ditto. Moths 2 ♂, 1 ♀	Ditto . .	Bred in Museum.
	7, *a—f*	Ditto. Cocoons .	Serampore, Hughli District.	
II.	8, *a—h*	*Bombyx meridionalis*. Cocoons	Cuddapah District, Madras.	
	9, *a—h*	Ditto. ditto.	Induradi village, Kollegal Taluk, Koimbatore District.	
	10, *a—j*	*Bombyx* sp. Cocoons .	Serampore, Hughli District.	
	11, *a—c*	*Bombyx fortunatus*. Hutton. "Desi silkworm." Moths 2♂, 1♀	Sadah, Rajshaye .	Bred in Museum. (Pl. II., Figs. 1 and 2.)
	12, *a—h*	Ditto. Cocoons.	Ditto.	
	13, *a—i*	*Bombyx crœsi*, Hutton. "Madrassee silkworm." Cocoons	Sardah, Rajshahye.	
	14, *a—c*	Ditto. Moths 2♂, 1 ♀	Ditto. . .	Bred in Museum.
	15, *a—b*	*Bombyx* sp. Cocoons .	Rungpore.	
III.	16, *a—c*	*Bombyx* sp. "Pat silkworm." Cocoons	Assam . .	? = Bara Poloo.
	17, *a.*	*Theophila Huttoni*, West w. ♂ ♀ M ths	?	From Hutton's collection.
	18, *a—b*	*Theophila Huttoni*, West w. Cocoons.	Pokaria, Govindpore.	From wild mulberry.

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No. of Tray.	No. of Specimen.	Name and Nature of Specimen.	Locality.	Remarks.
	19, *a—e*	*Philosamia ricini*, Jones. Wild Cocoons	Lakhimpore, Assam.	Better known as *Attacus ricini*.
	20, *a*.	Ditto. Moth, ♂ .	Assam . .	Bred in Museum. (Pl. IX.)
	21, *a—h*	*Philosamia ricini*, Jones. Cocoons.	Kamrup, Assam.	
	22, *a—f*	Ditto. ditto.	Sylhet, Assam.	
IV.	23, *a—h*	Ditto. ditto.	Dinagepore.	
	24, *a—b*	Ditto. Moths, ♂, ♀ .	Ditto. . .	Bred in Museum. (Pl. IX.)
	25, *a*.	Ditto. Mass of Cocoons	Ditto. . .	Bred in Museum.
	26, *a—b*	Ditto. Moths, ♂, ♀ .	Burma . . .	Var. *a*.
	27, *a—f*	Ditto. Cocoons.	Assam.	
	28, *a—b*	Ditto. Moths, 2 ♂ .	Burma . .	Var. *b*.
V.	29, *a—f*	*P. cynthia*, Drury. Cocoons.	Near Almora.	(Pl. XIX., Fig. 2.) Better known as *Attacus cynthia*.
	30, *a—b*	Ditto. Moths, ♂, ♀ .	Sikkim.	(Pl. XVIII.)
	31, *a—b*	*Attacus atlas*, Linn. Moths, ♂, ♀	Burma . .	Var. *a*.
	32, *a—b*	*A. atlas*, Linn. Moths, ♂ ♀	Burma . .	Var. *b*. (Pls. X. and XI.)
VI.	33, *a—c*	Ditto. Cocoons .	Aligarh.	(Pl. XII., Fig. 2.)
	34, *a—b*	Ditto. Moths, ♂, ♀	Sikkim.	
VII.	35, *a*	*A. Edwardsii*, White. Cocoon	Lakhimpur, Assam	"Bun Muga."
	36, *a—b*	Ditto. Moths, 2 ♀	Sikkim.	
VIII.	37, *a*	*Actias selene*, Mc'Leay. Cocoon	Sylhet.	(Pl. XIV., Fig. 3.)
	38, *a—b*	Ditto. Moths, ♂, ♀	Sikkim.	(Pl. XIV., Fig. 1.; Pl. XV.)
	39, *a—b*	*A. leto*, Doubleday, Moths,	Ditto . . .	*A. mœnas* is the opposite sex of this species.
IX.	40, *a—e*	*Antheræopsis assama*, Helfer. Cocoons	Sibsagar and Kamrup, Assam	3 pale ones = "Mezankoori Muga." Better known as *Antheræa Assama*.
	41, *a—d*	Ditto. Cocoons .	Lakhimpur, Assam	On "Hingari" leaves.
	42, *a—b*	Ditto. Moths, ♂, ♀ .	Mungaldai, Assam	Bred in Museum. (Pl. VI.)
	43, *a*	*Cricula trifenestrata*, Helfer. Bunch of Cocoons	Ranchi . .	? Winter Cocoons. This silkworm spins its cocoons in cluster bunches or colonies, which are suspended to the small branches of the trees on which the worms feed, by silken cords or shreds.

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No. of Tray.	No. of Specimen.	Name and Nature of Specimen.	Locality.	Remarks.
	44, *a*—*d*	*Cricula trifenestrata*, Helfer. Moths, 1 ♂, 3 ♀	Ranchi . .	Bred in Museum. (Pl. XIII.)
X.	45, *a*—*c*	*Antheræa mylitta*, Drury. Cocoons.	Singbhoom.	
	46, *a*—*b*	Ditto. Cocoons	Phillour, Panjáb.	
	47, *a*—*e*	*A. mylitta*, Drury, Cocoons	Burdwan.	
	48, *a*	*A. mylitta*, Drury, var. Cocoon	Calcutta . .	Showing mode of attachment to shoot of *Terminalia catappa*. At the end of the pedicle of the cocoon is a ring, which, like the pedicle itself, consists of silk, and which firmly clasps the twig, to which the cocoon hangs suspended like a berry. (Pl. V.)
	49, *a*	*Antheræa mylitta*, Drury, var. Cocoon	Calcutta . .	To show mode of attachment to petiole and midrib of leaf of *T. catappa*.
	50, *a*	Ditto. . . .	Ditto. .	Showing 4 successive annular attachments below the pulvinus of as many leaves of a shoot of *Terminalia arjuna*.
	51, *a*—*b*	Ditto. Moths, ♂, ♀ .	Ditto . .	Bred in Museum from wild cocoons found on *T. catappa* ("Badám"). (Pl. III.)
XI.	52, *a*—*g*	*Antheræa mylitta*, var. *nebulosa*, Hutton, 1 ♂, 6 ♀ Moths	Maunbhum . .	Differing greatly on the upper surface in the shade of the ground colour, they are all alike below in both sexes. Bred in Museum.
	53, *a*—*b*	*Antheræa Frithii*, Moore, ♂ Moths	Sikkim . .	Cocoon unknown. (Pl. VIII., Fig. 2.)
XII.	54, *a*—*b*	*Antheræa Helferi*, Moore, ♂ & ♀ Moths.	Ditto . .	Ditto. (Pl. XVI., Fig. 1.)
	55, *a*—*b*	*Caligula simla*, Westwood, ♂ & ♀ Moths	N.-W. Himalayas.	♂ from Mussoorie; ♀ from Kumaon from the Hutton collection. (Pl. XVI., Fig. 2.)
	56, *a*	*Neoris Huttoni*, Moore, ♀ Moth	Ditto. . .	From the Hutton collection. (Pl. XIX. Fig. 3.)
	57, *a*—*b*	*Rinaca zuleika* Hope, ♂ Moth and Cocoon	Sikkim . .	Silk of no practical value.
	58, *a*	*Salassa lola*, Westwood, ♀ Moth	Ditto. . .	Cocoon unknown.

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583. Living eggs and cocoons of the Indian Tussur silkworm, *Antheræa mylitta.*

584. Living eggs, larvæ or caterpillars, cocoons and moths of the Chinese Tussur silkworm, *Antheræa pernyi.* The caterpillars are feeding on the leaves of the oak tree. (Pl XVII.)

585. Living eggs, cocoons and moths of the Eria silkworm, *Attacus ricini.* Assam. (Pl.IX.)

586. Living eggs, cocoons and moths of *Attacus cynthia.* This is the wild form found in the Tarai on the Himalayan slopes. (Pls. XVIII., XIX., Figs. 1 and 2.)

587. Living eggs, caterpillars, cocoons and moths of *Cricula trifenestrata.* Ranchi, Chutiá Nágpur, Bengal. The caterpillars are feeding on the leaves of the plum tree, but their natural food is the leaves of *Oroxylun indicum,* "*Khandan,*" and *Tetranthera monopetala,* "*Pojah.*" (Pl. XIII.)

588. Living eggs, cocoons and moths of *Samia cecropia.*

589. Very rare species of an unnamed *Psychideæ* of Senegal. Living cocoons and moths. The female of this species is wingless and never leaves the cocoon, whilst the male has small transparent wings, and very much resembles the hive bee.

590. Living cocoons and moths of a species of *Psychideæ* from Ranchi, Chutiá Nágpur, Bengal, the caterpillars of which feeds on the tea plant.

591. Living grubs and chrysalides of a parasitic Dipterous fly, which lays its egg in the caterpillar of *Cricula trifenestrata.* If the cocoon of the *Cricula trifenestrata* is to become of commercial importance it will be necessary to protect the worm from the attack of this Dipterous fly. I have found in some of the bunches of cocoons 80 per cent. of the worms killed by it.

592. Living caterpillars and cocoons of *Actias luna,* from North America. The caterpillars are feeding on the walnut tree.

593. Water-colour drawing of the eggs, caterpillars, cocoons and moths of the Indian Tussur silkworm, *Antheræa mylitta,* represented as being attached to a branch of *Lagerstræmia Indica,* upon the leaves of which the caterpillars feed. Lent by Lt.-Col. Coussmaker, Westwood, Guildford, Surrey. Late of Pooma, Bombay.

Notes to Plates.

On Pls. XXVIII. and XXIX. will be found drawings of the microscopic appearances of the different fibres of silk, which give a correct idea of their varying structure.

On Pl. XXXVIII. are a few representations of the microscopic appearances of the scales of a few of the silk-producing moths. See also Pl. XXII., Fig. 2.

I have also added, in Pls. XXX. to XXXVII., representations of some of the plants which furnish the food of several species of Indian silkworms.

In the Santal Jungles the leaves of *Terminalia tomentosa* (Pl. XXX.) form the food of those Tussur silkworms whose cocoons are intended to be utilised industrially. The worms whose cocoons are intended for breeding are fed on the leaves of *Shorea robusta* (Pl. XXXI.).

The prices of Tussur cocoons in Fatwa, Manbhum, Gaya, and Chutia Nagpur are shown in the following table (January, 1886):—

Fatwa	120 cocoons per rupee	...	Best cocoons
	160 „ „	...	Common cocoons
Manbhum	5 to 7 rupees for 800	...	
Gaya	10 rupees for 1000	...	
Chutia Nagpur ...	320 cocoons per rupee	...	Formerly
	240 „ „	...	Recently
	160 to 200 „ „	...	Price which the natives are now demanding.

At the beginning of the year the contract price for Indian Tussur waste silk was in France 1*s.* 6*d.* per lb., the highest rate yet obtained, and for Tussur raw silk of the improved reeling 7*s.* 3*d.* per lb., as against 4*s.* 8½*d.* per lb. for Chinese Tussur raw silk.

The Collector of Vizagapatam informed me that immense tracts of country in his district produced Tussur cocoons.

A few particulars of the value of Muga and Eria silks may be useful in this catalogue.

1. Muga. The silk of the Muga cocoon is reeled, not spun. The two principal trees upon which the Muga silkworm feeds are the *Soom* (*Machilus odoratissima*), Pl. XXXIII., and the *Sualu* (*Tetranthera monopetala*). The price for cocoons for reeling is 500 to 800 cocoons for

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R. 1. The price for waste cocoons is Rs. 2 per seer containing nearly 3000 cocoons, or 1*s.* 6*d.* per lb. The price of Muga raw silk is from Rs. 8 to Rs. 12 per seer, or 6*s.* to 9*s.* per lb. Muga spun yarn can be bought for Rs. 4 per seer, or 3*s.* per lb. The price of Muga cloth in Assam varies from Rs. 1·8 to Rs. 2 (2*s.* 3*d.* to 3*s.*) per square yard.

2. Eria.—Eria cocoons are sold at Rs. 2·8 to Rs. 3 per seer, containing about 3600 cocoons, or 1*s.* 10½*d.* to 2*s.* 3*d.* per lb. Pierced Eria cocoons sell in Calcutta at Rs. 60 to Rs. 70 per maund of 82 lbs., or 1*s.* 1*d.* to 1*s.* 3*d.* per lb. Cocoons containing the dessicated chrysalis sell at the rate of 1200 to 1500 per rupee or at about 9 annas per seer, containing 700 cocoons (5d. per lb). The prices, however, vary much. The value of the thread varies from Rs. 4 to Rs. 7 per seer, or 3*s.* to 5*s.* 3*d.* per lb. Eria thread, I should mention, is made of silk spun from the cocoon and not reeled, as it is not practicable to reel this cocoon. The value of Eria cloth woven with this spun thread varies from Rs. 7 to Rs. 20 for 6 to 7 yards according to quality, or 1*s.* 6*d.* to 5*s.* per yard.

The *Philosamia* or *Attacus cynthia* (Pls. XVIII., XIX. Figs. 1 and 2) is found wild in the Terai.

The *Philosamia* or *Attacus ricini* of Assam (Pl. IX.) is said to owe its difference from *A. cynthia* to domestication.

A few short particulars about Indian Sericulture will not be out of place here, and should be useful hereafter to India.

The *Desi* or *Chota poloo* silkworm of Bengal (*Bombyx fortunatus*), No. 352, &c., is said to have been imported from China, in 1771, by the East India Company, but the pure variety is now only to be found in Bogree, Midnapur.

The *Madrassee* or *Nistri poloo* silkworm (*Bombyx crœsi*), No. 355, &c., is found throughout the silk districts of Bengal. It is characterised by having round and not crescent marks.

The *Boro poloo* silkworm, the only univoltine variety, No. 369, and others, is found only in parts of Murshidabad, Hugli, Midnapur and Birbhum Districts. It is said to have been introduced in 1710, but is gradually being neglected by rearers as precarious and uncertain.

Another variety of the mulberry silkworm, known as *Chini*, is found only in Midnapur, Bengal. This silkworm, as well as the *Boro poloo*, has cresent marks.

Cocoons of Mulberry silkworms for seed, purchased in different districts, are called *Sunchoo*.

The mulberry feeding silkworms of Bengal have four moultings, being in the first stage black, the second blackish-grey, the third grey and the fourth greenish-white or grey. The leaves are given to the worms at first chopped up, after the third moulting detached from the twigs, and after the fourth moulting attached to the twigs. Thirty or forty pounds of cocoons are obtained from an English ounce of eggs. A *bigha** of land gives four crops of leaf in the year, and the produce of cocoons reared per *bigha* in the year is 3 *maunds*.†

In the Punjaub experiments from eggs of French, Italian and Japanese origin yielded 40 lbs. of cocoons per ounce of eggs, and that 16 lbs. of fresh cocoons yielded 1 lb. of raw silk. In Europe 12 lbs. to 14 lbs. of cocoons yield 1 lb. of silk.

In Italy and in France sericulturists obtain 40 to 60 kilogrammes of cocoons per ounce of eggs, but the yields vary with locality and climate. This larger yield is the result of studying the worms, in selection of eggs, in crossing the numerous varieties of the silk-worms.

The mulberry in Bengal (*Morus Indica*), *Tût*, is grown in clayey or sandy soils as a perennial shrub. It is cut down seven to eight times a year. It is planted once and remains in the soil until it wears itself out, or the ryot finds other crops more profitable. New earth is generally put on to renew the soil. The roots belong to the ryot and not to the zamindar.

No. 447. The silks which bear the mark G. G. McP. are from the Bengal Silk Company. This mark is a contraction of G. G. McPherson, who was one of the founders of this industry.

From the 11th to the 16th of January, 1886, an exhibition of silk cocoons was held at Rampore Beauleah, Rajshahi District, Bengal. It was opened and actively supported by Lord H. Ulick Browne, Commissioner of the Rajshahi Division, who believes that it has undoubtedly fostered a spirit of emulation among the cocoon rearers by bringing together the cocoons of various silk producing tracts, and says that there are grounds for hoping that similar Exhibitions held in the different silk producing districts, in different years, may lead to good results.

* There are three *bighas* in an English acre.

† A *maund* is about 82 lbs.

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A prize of Rs. 50 was awarded to Baboo Roma Nath Sen, the author of the best Bengali essay on the method of rearing silk cocoons. This essay is intended to be printed, and copies distributed among the exhibitors. The money for the prizes was raised by subscriptions in the neighbourhood, to which Government added an equal sum.

The number of exhibits were as under:—

Rajshahi	...	...	...	...	...	...	141
Murshidabad	...	...	...	...	...	...	83
Birbhum	...	...	...	...	...	...	5
Naidya ...	...	...	...	...	...	...	1
				Total	...	...	230

The following are the silk districts of Bengal:—

Bardwan.	Jessor.
Bankura.	Murshidabad.
Birbhum.	Rajshahi.
Midnapur.	Rangpur.
Hugli with Howrah and Serampur.	Bogra.
Parganas.	Maldah.
Nadiya.	

Nos. 241 and 242. The spider silk exhibited under these numbers was obtained in 1885, when it was found that in the beginning of October a sufficient number of webs had been spun to make it worth while to commence the collection.

After a certain number of trials it was found best to collect the silk by winding the webs carefully round smooth sticks, from which they may be removed by the application of hot water, but it is impossible to unreel the silk directly from the sticks.

An immense number of webs were collected during the month of October, but so extremely light is the substance that it was impossible to procure anything like the quantity (viz. 200 lbs.) asked for by the Government of India. The amount obtained, including the sticks, was only 28 lbs., the expense of collecting which was Rs. 38 6 0. This silk on sticks was sent to me by the Government of India for experiment. I sent it to Messrs. Brocklehurst & Sons, Macclesfield, who reported that, owing to the small quantity sent and to its being so mixed with refuse matter, they were unable to card and spin it.

I am informed that the French Government has lately sent out forty reeling machines to Madras for reeling Tussur cocoons.

The *Bombyx mori* cocoons, No. 382*a*, have been sent by Mr. S. Cunliffe Lister, of Manningham, Yorkshire, who informs me they are from the "Lister Grant" at Dehra Dun, and reared from French eggs sent out last autumn, and that he has 2000 acres there now under mulberry cultivation, and is planting several hundred acres per annum. It takes five years by his system for the mulberry plants to be of the proper age. These cocoons resemble in size, form and colour the race cultivated in Provence. I have reeled excellent silk from them in the Silk Culture Court here of 10–12 deniers with the Tavelette Consono. *See* Raw Silk, No. 272*a*.

The Exhibits in this Indian Silk Culture Court number upwards of 800.

In addition to the thirty-eight varieties of the cocoons of the mulberry-fed silkworm (*Bombyx mori*), other than those of Bengal, which are described under No. 270, and exhibited as aids to sericultural study, I have received, since the type of this catalogue was set up and too late to be described in their proper place, twenty-three specimens of other varieties, chiefly Italian, and which I am placing in the exhibited collection. They are as follows:—

1. Yellow, from Romagna or Ascoli, reared in Piedmont.
2. Yellow, from Pyrenees, reared in Piedmont.
3. Yellow, from Var, reared in Piedmont.
4. Yellow, from Istria, reared in Friouli.
5. Yellow, from France, reared in Syria.
6. Yellow satinés (oozy), inferior, reared in Piedmont.
7. Yellow muscardinés (chrysalis dried up), reared in Piedmont.

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8. Yellow, double, reared in Piedmont.
9. White, from Adrianople, reared in Piedmont.
10. White, from Adrianople, muscardinés, reared in Piedmont.
11. White, from Japan, reared in Piedmont.
12. White, from Japan, seed laid in Italy, reared in Piedmont.
13. Green small cocoons, reared in Piedmont.
14. Green large cocoons, reared in Piedmont.
15. Green inferior satinés, reared in Piedmont.
16. Green inferior rusted (Rouillés), reared in Piedmont.
17. Green, double, reared in Piedmont.
18. Green, white cross, reared in Friouli.
19. Yellow, white cross, reared in Friouli.
20. Yellow, green cross, reared in Friouli.
21. Yellow and white-pierced cocoons, reared in Friouli.
22. Good cocoons, from Romagna.
23. Double cocoons, from Romagna.

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ALPHABETICAL LIST OF PLACES IN BRITISH INDIA WHERE SILK IS PRODUCED OR MANUFACTURED.

A.

Adoni (Mad.)
Agra (N. W. P.)
Ahmedabad (Bom.)
Almora (N. W. P.)
Amritsar (Punj.)
Andijon (Punj.)
Arcot (N. W. P.)
Arni (Mad.)
Arrah (Beng.)
Assam
Aurangabad (Nizam.)
Ava (Beng.)
Azamgarh (N. W. P.).

B.

Bagra (Beng.)
Baharapur (Punj.)
Bahawalpur (Punj.)
Balasor (Beng.)
Bamm
Bancoop (Beng.)
Bangalore (Mys.)
Bankura (Beng.)
Baramba (Cuttack, Beng.)
Bardwan, Beng.)
Barhampur (Beng)
Barhanpur (C. P.)
Baroda (Bom.)
Behar (Beng.)
Bekanir
Belgaum (Bom.)
Bellary (Mad.)
Benares (N. W. P.)
Bengal
Bhandara (C. P.)
Bhagalpur (Beng.)
Bhuj (Bom.)
Bijapur (Bom.)
Birthum (Beng.)
Bishnapur (Beng.)
Bombay
Broach (Bom.)
Bulasor (Beng.)
Bura (C. I.)
Burma.

C.

Calcutta (Beng.)
Cambay (Bom.)
Cashmère
Chamapatna (Mys.)
Champaner (ancient, now in ruins, Bom.)
Chamapatna (Mys.)

C. (*continued.*)

Champawr (Bhogapur, Beng.)
Chanderi (Indore State, Central India).
Chutia Nagpur (Benj.)
Chingleput (Mad.)
Chittagong (Beng.)
Cossimbozor (Beng.)
Cuddelore (Mad)
Cutch (Bom.)
Cuttach (Beng.)

D.

Dacca (Beng.)
Darjeeling (Beng)
Darrang (A.)
Dehradun (N. W. P.)
Delhi (Punj.)
Devás (C. I.)
Dhar (C. I.)
Dharwar (Bom.)
Dinapur (Beng)
Dinajpur (Beng.)

F.

French Rocks (Mys.)
Futwah (Behar, Beng.)

G.

Galampore.
Gaya (Beng.)
Ghátál (Beng.)
Giridi (Beng.)
Goalpara (A.)
Gopinàlhpur (Bankura, Beng.)
Gorakhpore (N. W. P.)
Gujerath (Bom.)
Gurdapore (Punj.)
Gwalior (Scindia).

H.

Hazaribagh
Hill Tipperah
Hugli (Beng.) with Hourah
Hyderabad (Deccan, Nizam).
Hyderabad (Sind, Bom.)

I.

Indore (Holkar)

J.

Jallandar (Punj.)
Jalpaigori (Beng.)
Jàmnagar (Bom.)
Jangipur (Beng.)
Jhelam (Punj.)

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K.

Kagra (Beng.)
Kalàdgi (Bom.)
Kampli (Mad.)
Kandwa.
Karàchi (Bom)
Kathiawar (Bom.)
Keonjhar (Cuttach, Beng.)
Kistna (Mad.)
Kohat (Punj.)
Koraad (Mad.)
Kotah State.
Kunegal (Mys.)

L.

Lahore (Punj.)

M.

Madras.
Malda (Beng.)
Manbhum (Beng.)
Manipur (A.)
Mayurbhanj, Cuttach (Beng.)
Maywar (Udepur).
Meerbhung
Midnapur (Beng.)
Mirpur (Beng.)
Moulmein (Bur.)
Multan (Punj.)
Murshidabad (Beng.)
Mysore.

N.

Nadiya.
Naga Hills (A.)
Nagpur (C. P.)
Náráyan Peth (Nizam).
Nasik (Bom.)
Navánagar (Jámnagar (Bom.)
Northern circle (Mad.)

O.

Orrisa (Beng.).
Oudh (N. W. P.)

P.

Paithan (Nizam).
Palampur (Punj.)
Parebanda (Bom.)
Patiala (Punj.)
Patna (Beng.)
Pauni, Bhandara, Nagpur (C. I.)
Pegu (Bur.)
Peome (Beng.)

P. (*continued.*)

Peshawar (Punj.)
Poona (Bom.)
Punjab
Puri (Beng.).

R.

Raichuri (C. P.)
Rajshahi (Beng.)
Rampur Bantia (Beng.)
Ranchi (Beng.)
Rangoon (Bur.)
Rangpur (Beng.)
Rewah (C. I.)
Rewdanda (Bom.)
Royapetta (Beng.).

S.

Salem (Mad.)
Sambalpur (C. P.)
Sángli (Bom.)
Sansmond (Mys.)
Sásvad (Bom.)
Serampur.
Shahapur (Punj)
Sherpur (Beng.)
Shikarpu (Bom.)
Sholapur (Bom.)
Sial Kot (Punj.)
Sibsagar (A.)
Sibpur (Beng.)
Singapur
Singbhum (Beng.)
Southern circle (Mad.)
Surdah (Beng.)
Surat (Bom.)

T.

Tanjore (Mad.)
Tatta (Bom.)
Tenasserim (Beng.)
Thana (Bom.)
Tigaria, Cuttach (Beng.).

U.

Umrer, near Nagpur (C. P.).

Y.

Yelgundal (Mad.)
Yeola (Bom.)
Yerkah (Mad.)
Yurkund (Punj.).

LIST OF ABBREVIATIONS SHOWING THE NAMES OF THE PROVINCES.

Ben.	=	Bengal.
Punj.	=	Punjab.
Bom.	=	Bombay.
Mad.	=	Madras.
N. W. P.	=	North-Western Provinces.
Nizam.	=	H.H. the Nizam's Territory.
Mys.	=	Mysore.
C. P.	=	Central Provinces.
C. I.	=	Central India.
Scindia.	=	H.H. the Scindia's Territory.
Holkar	=	H.H. the Holkar's Territory.
Jaipur.	=	H.H. the Maharaja of Jaipur's Territory.
Bur.	=	British Burma.

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ILLUSTRATIONS.

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PLATE II.

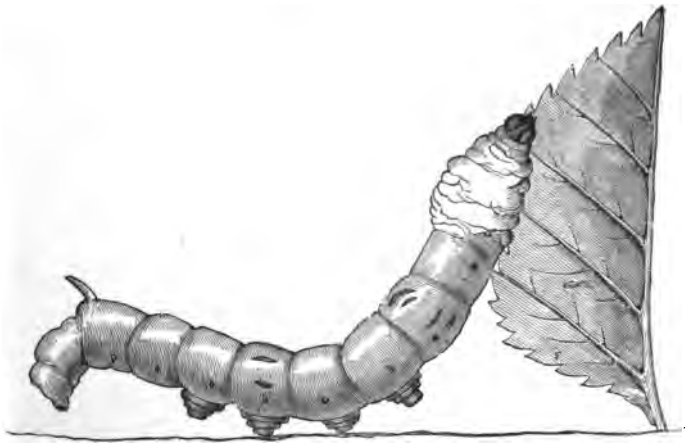
FIG. 1.

Bombyx mori, or mulberry feeding silkworm (Male).

FIG. 2.

Bombyx mori (Female).

FIG. 3.

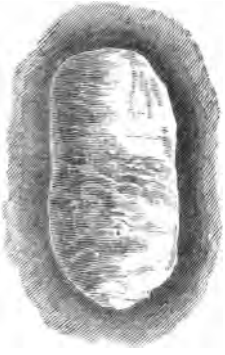


Larva of Bombyx mori.
No. in Collection, 243.

FIG. 4.

Cocoon of Bombyx fortunatus from Bengal.
No. in Collection, 352.

FIG. 5.



Cocoon of Bombyx mori reared in Italy from Japan seed.
No. in Collection, 270 mm.

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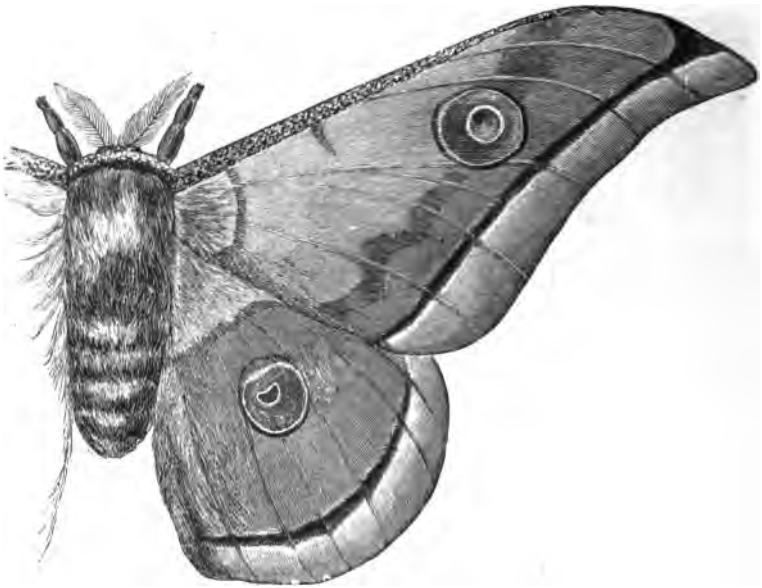
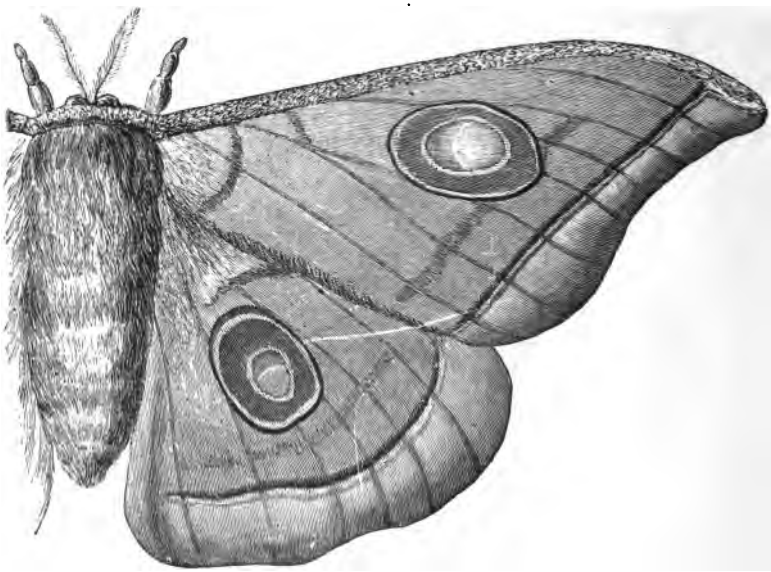
PLATE III.

FIG. 1.



Antheræa mylitta or Tussur moth (Male).
No. in Collection, 582. No. in Entomological List, 51a.

FIG. 2.



Antheræa mylitta or Tussur moth (Female).
No. in Collection, 582. No. in Entomological List, 51b.

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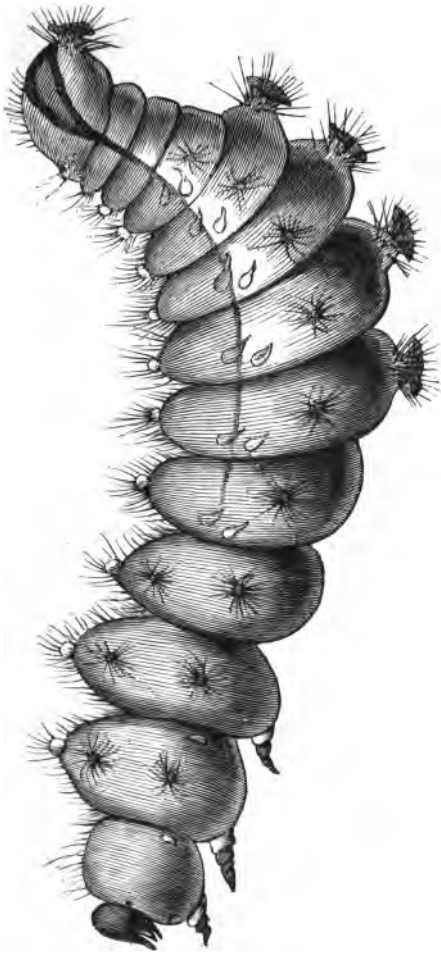

Larva of Antherœa mylitta or Tussur silkworm.
No. in Collection, 245.

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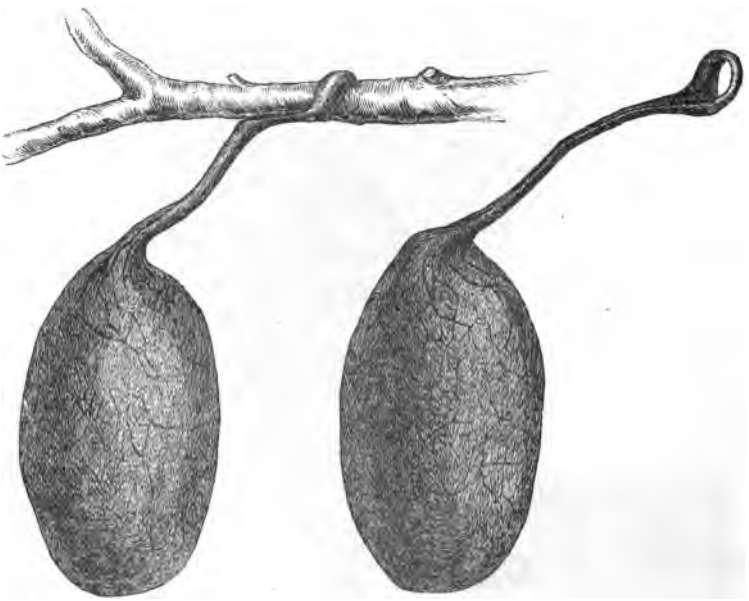
PLATE V.

FIG. 1.



Tussur cocoons.
No. in Collection, 264.

FIG. 2.

Tussur coccon cut open to show the chrysal s inside.
No. in Collection, 264.

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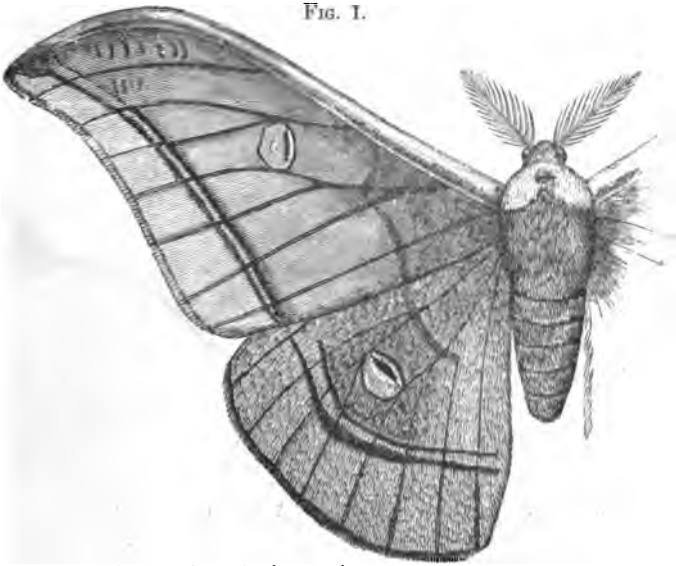
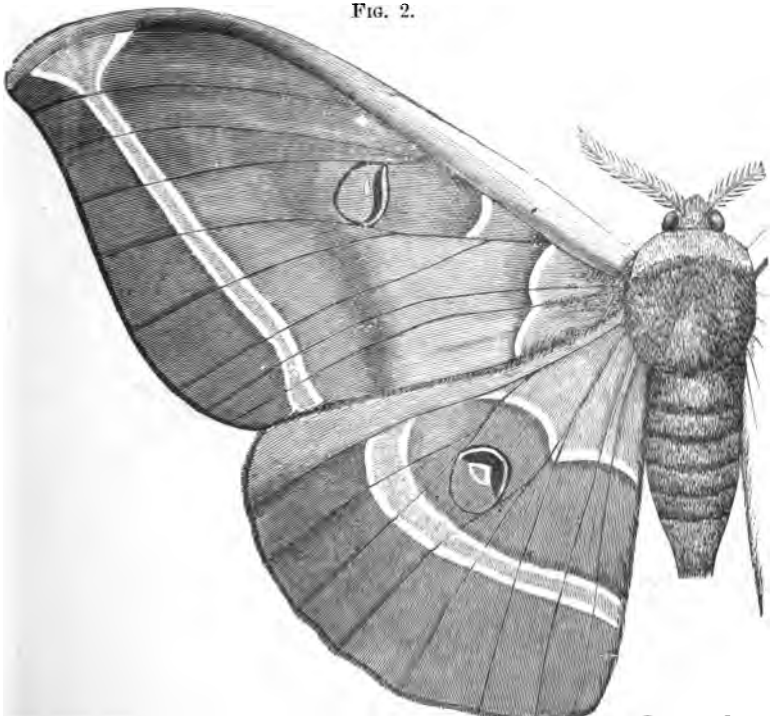
PLATE VI.

FIG. 1.



Antheræopsis or Antheræa Assama or Muga moth (Male).
No. in Collection, 582. No. in Entomological List, 42a.

FIG. 2.

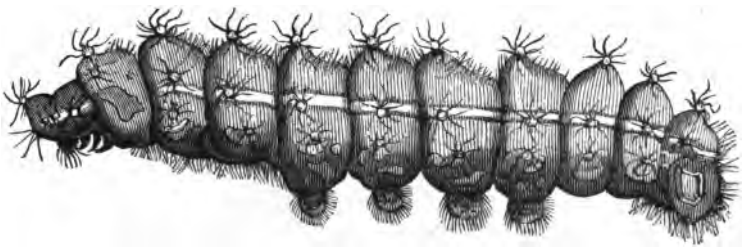


Antheræopsis or Antheræa Assama or Muga moth (Female).
No. in Collection, 582. No. in Entomological List, 42b.

Google

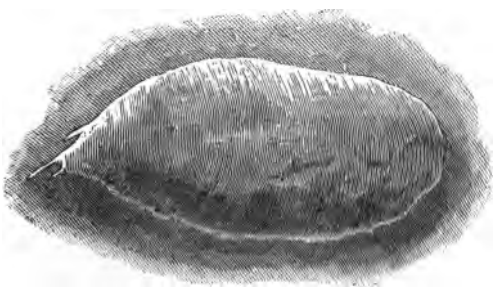
PLATE VII.

FIG. 1.



Larva of Antheræopsis or Antheræa Assama or Muga silkworm.

FIG. 2.



Muga cocoon.
No. in Collection, 431.

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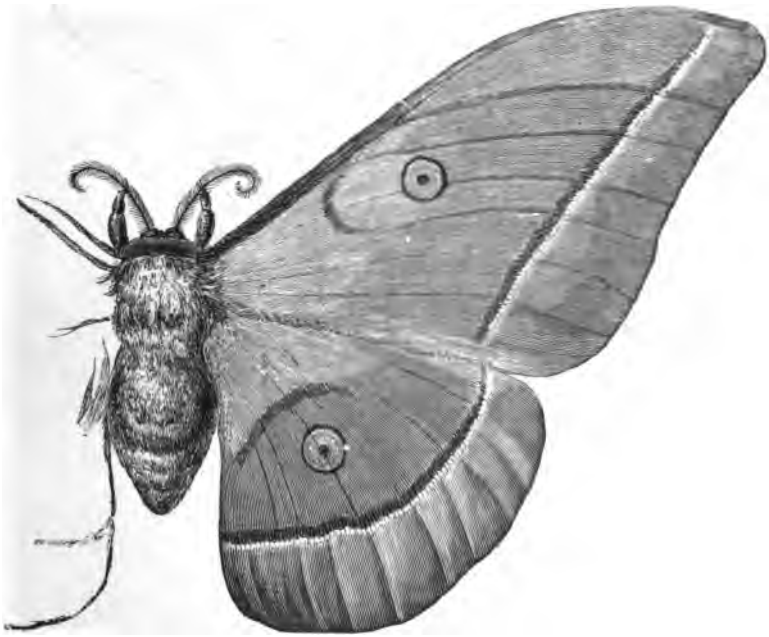
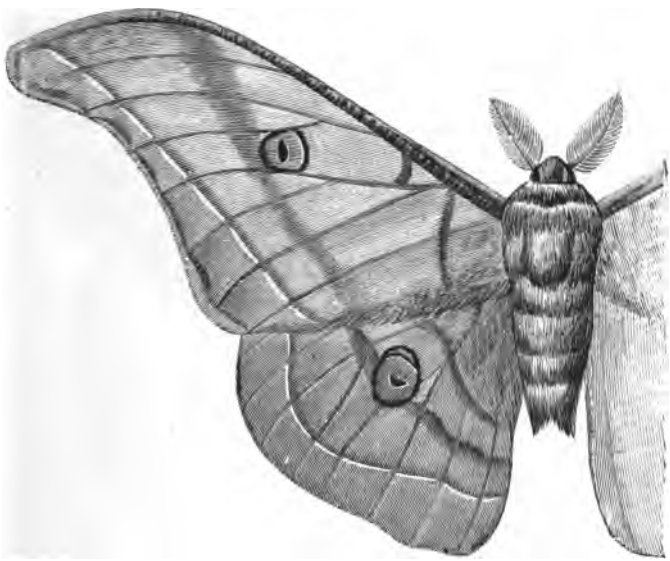
PLATE VIII.

FIG. 1.



Antheræa Roylei (Female).

FIG. 2.



Antheræa Frithii (Male).

No. in Collection, 582. No. in Entomological List, 53a.

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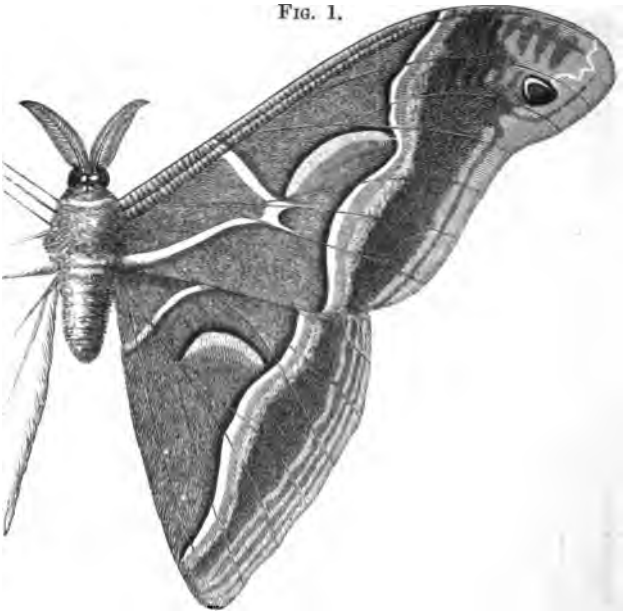
PLATE IX.

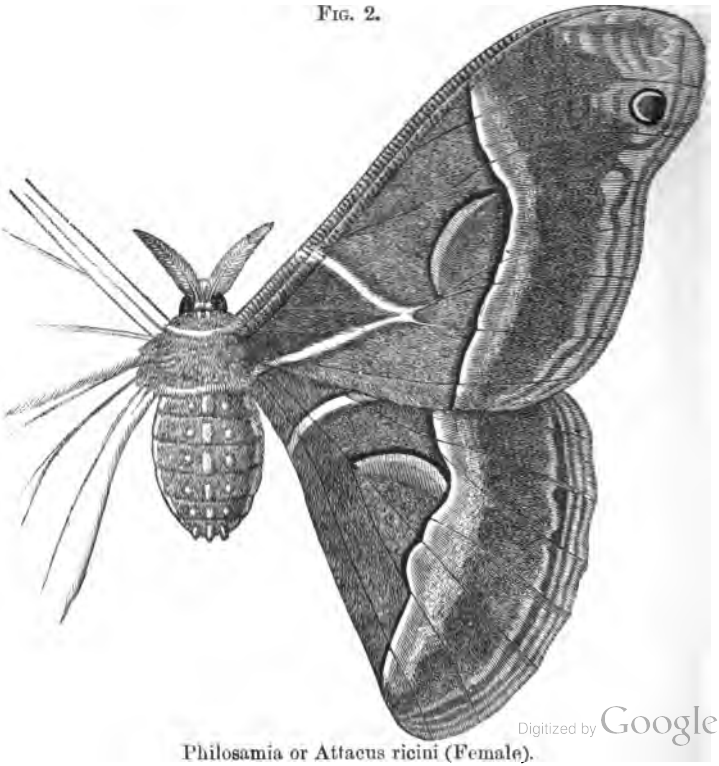
FIG. 1.



Philosamia or Attacus ricini (Male).

No. in Collection, 582. No. in Entomological List, 24a.

FIG. 2.



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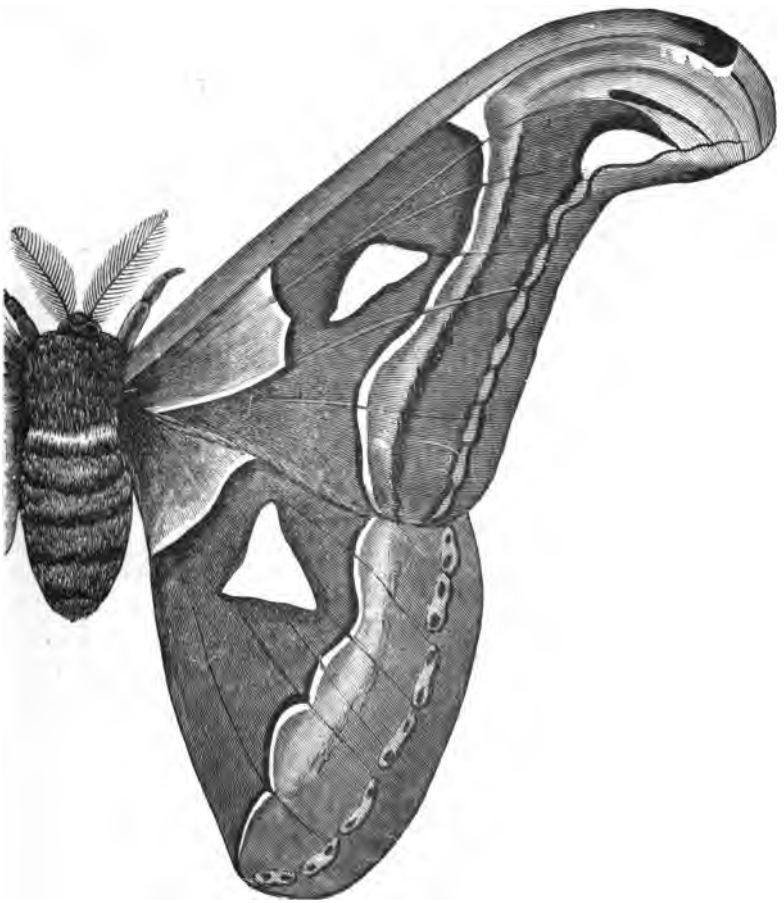
Philosamia or Attacus ricini (Female).

No. in Collection, 582. No. in Entomological List, 24b.

PLATE X.



Attacus Atlas (Male).

No. in Collection, 582. No. in Entomological List, 31a.

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PLATE XI.

Attacus Atlas (Female).

No. in Collection, 582. No. in Entomological List, 31b.

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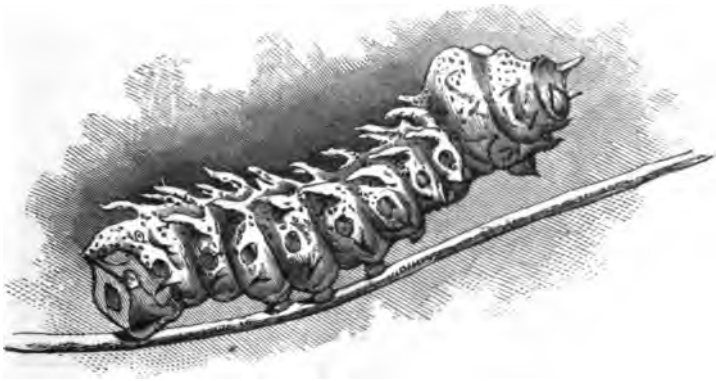
PLATE XII.

FIG. 1.



Larva of Attacus Atlas or Atlas silkworm.

FIG. 2.

Cocoon of Attacus Atlas.

No. in Collection, 582. No. in Entomological List, 33a.

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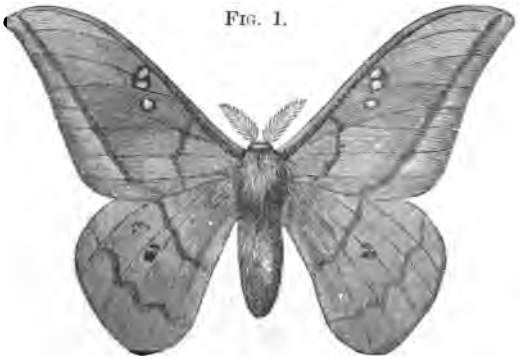
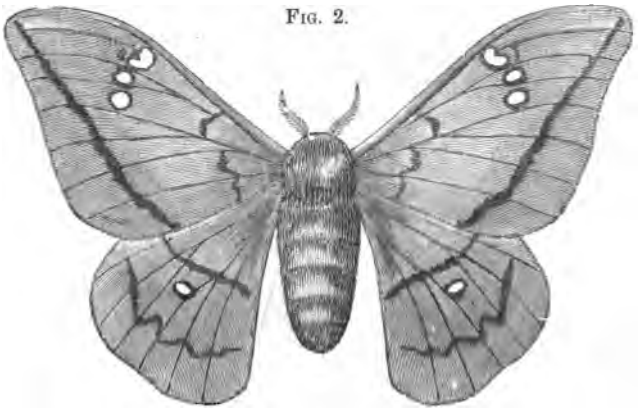
PLATE XIII.

FIG. 1.



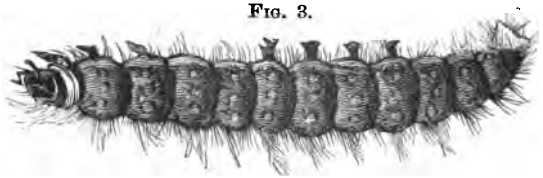
Cricula trifenestrata (Male).
No. in Collection, 582. No. in Entomological List, 44a.

FIG. 2.



Cricula trifenestrata (Female).
No. in Collection, 582. No. in Entomological List, 44d.

FIG. 3.



Larva of Cricula trifenestrata.
No. in Collection, 247.

FIG. 4.

Cocoon of Cricula trifenestrata.
No. in Collection, 434 and 435.

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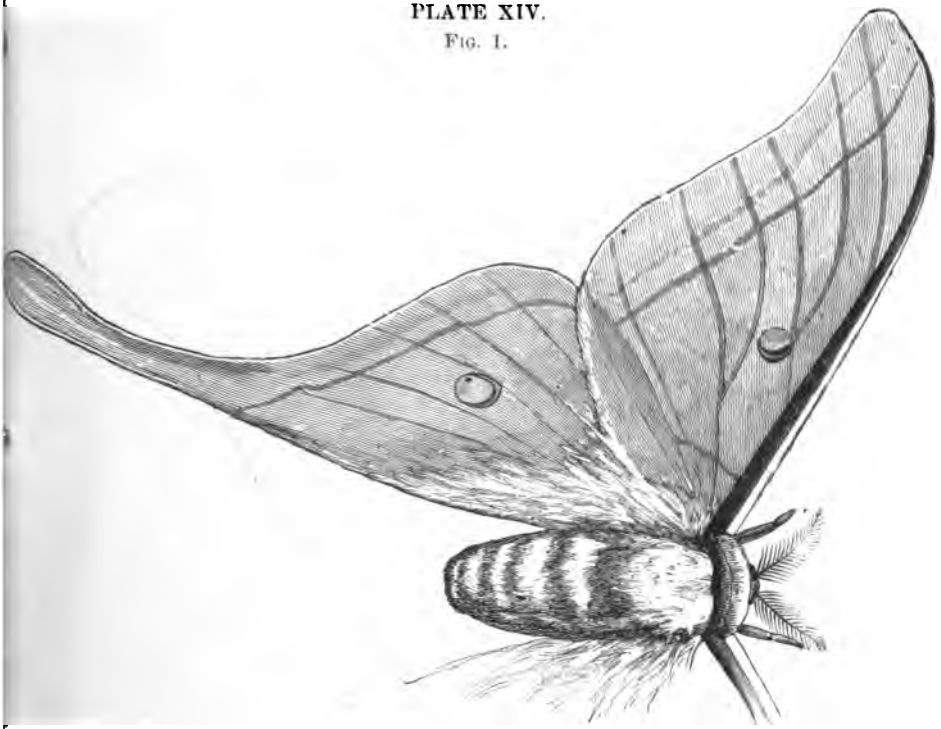
PLATE XIV.

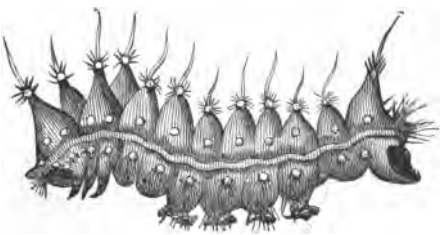
FIG. 1.



Actias selene (Male.)

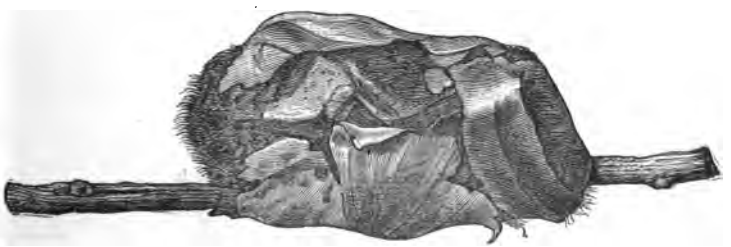
No. in Collection, 582. No. in Entomological List, 32a.

FIG. 2.



Larva of Actias selene.

FIG. 3.



Cocoon of Selene.

No. in Collection, 582. No. in Entomological List, 37a.

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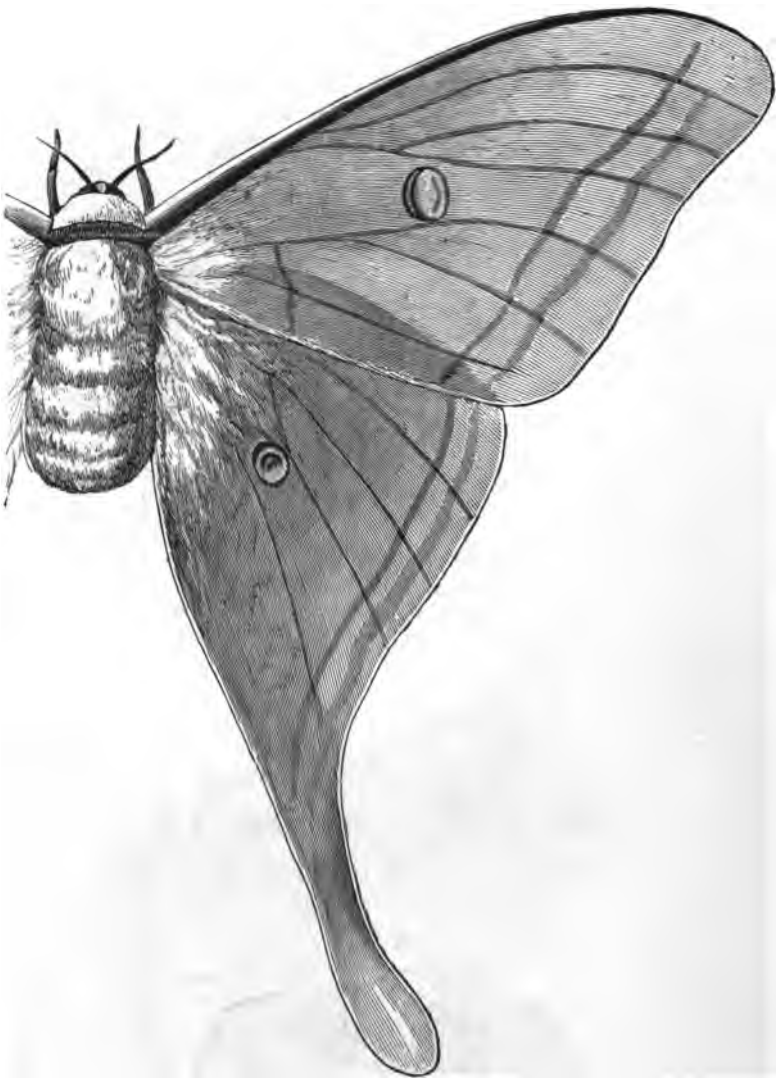
PLATE XV.



Actias selene (Female).

No. in Collection, 582. No. in Entomological Case, 38b.

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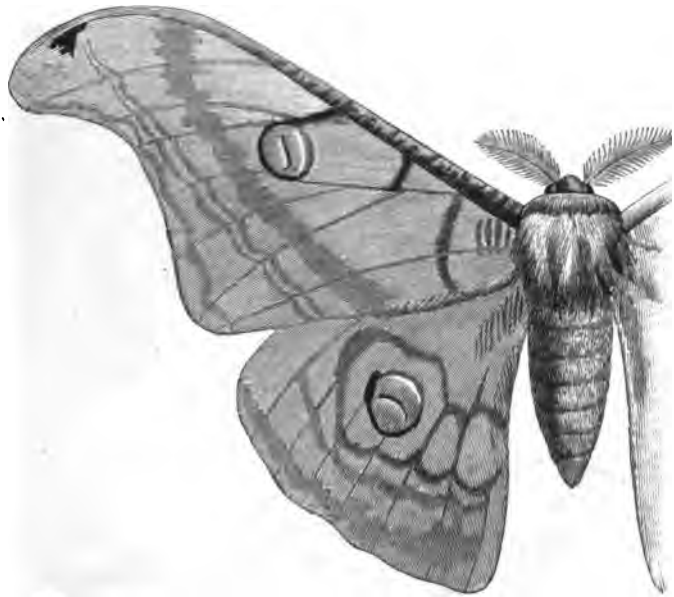
PLATE XVI.

FIG. 1.



Antheræa Helferi (Male).

FIG. 2.

Caligula Simla (Female).

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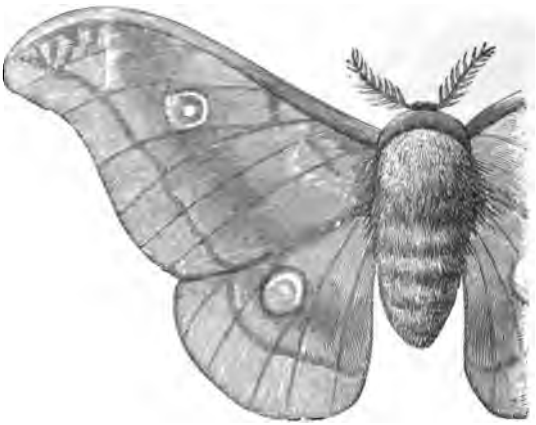
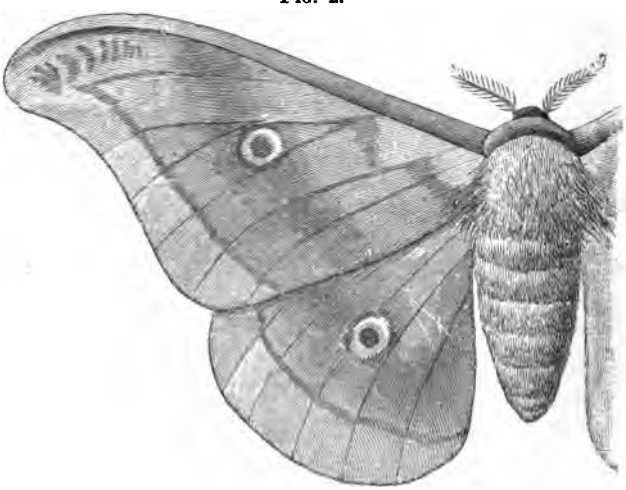
PLATE XVII.

FIG. 1.



Antheræa pernyi (Male).

FIG. 2.



Antheræa pernyi (Female).

FIG. 3.

Cocoon of Antheræa pernyi.

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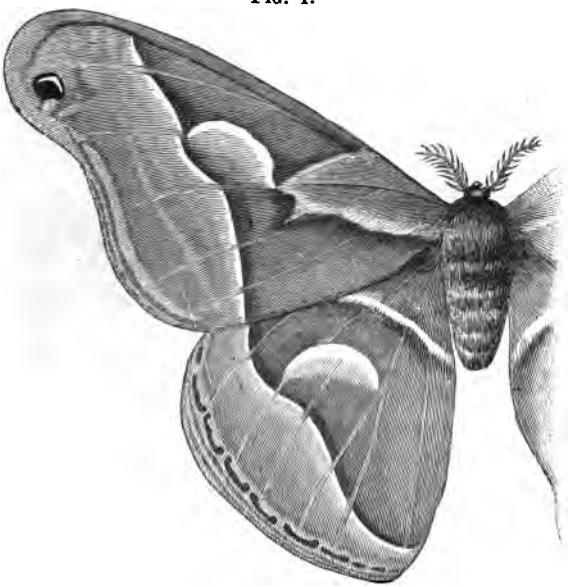
PLATE XVIII.

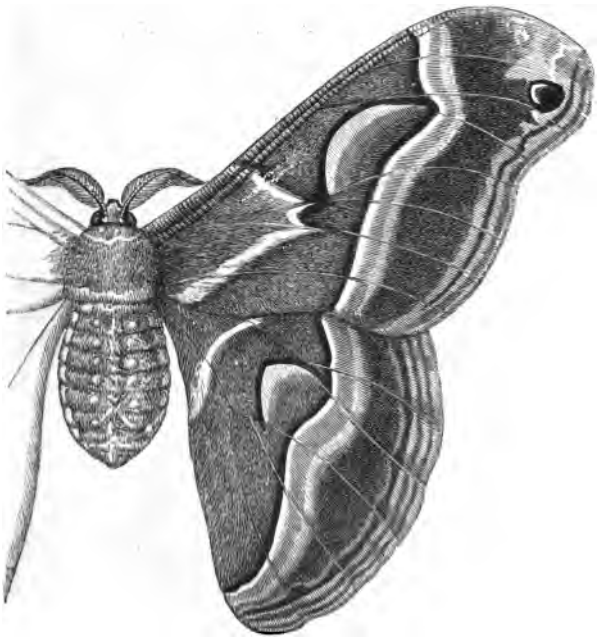
FIG. 1.



Philosamia or Attacus cynthia (Male).

No. in Collection, 582. No. in Entomological List, 30a.

FIG. 2.



Philosamia or Attacus cynthia (Female).

No. in Collection, 582. No. in Entomological List, 30b.

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PLATE XIX.

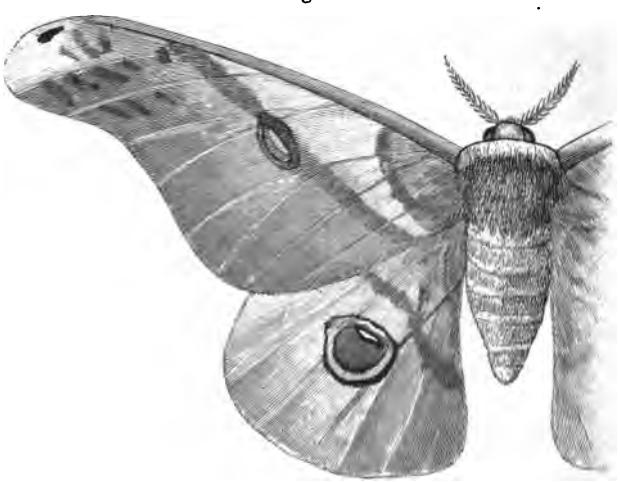
FIG. 1.

Larva of Philosamia or Attacus cynthia.

FIG. 2.

Cocoon of Philosamia or Attacus cynthia.

Fig. 3.



Neoris Huttoni.

No. in Collection, 582. No. in Entomological List, 56a.

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PLATE XX.

FIG. 1.

Saturnia carpini (Male).

FIG. 2.

Saturnia carpini (Female).

FIG. 3.

Saturnia Grotei (Female).

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PLATE XXI.

FIG. 1.

Loepa katinka (Male).

FIG. 2.

Loepa katinka (Female).

FIG. 3.

Larva of Loepa katinka.

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PLATE XXII.

FIG. 1.

Loepa miranda (Male).

FIG. 2.

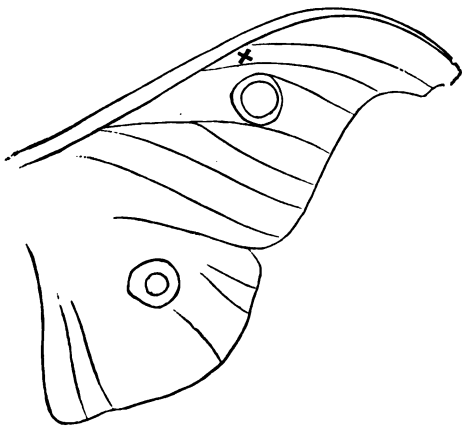

Diagram showing the Point (x) on wing from which the scales have been taken. (*See* Plates XLIX to LIV.)

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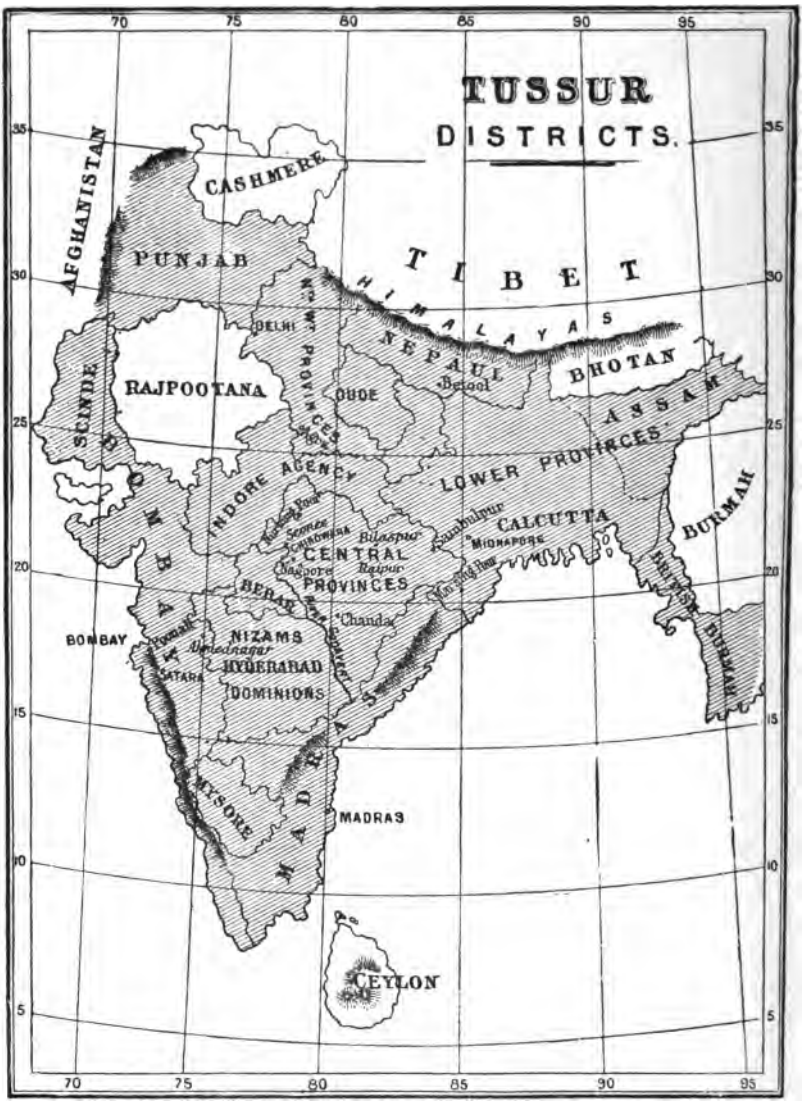
PLATE XXIII.



The shaded parts show the districts in which the Tussur moth has been found.

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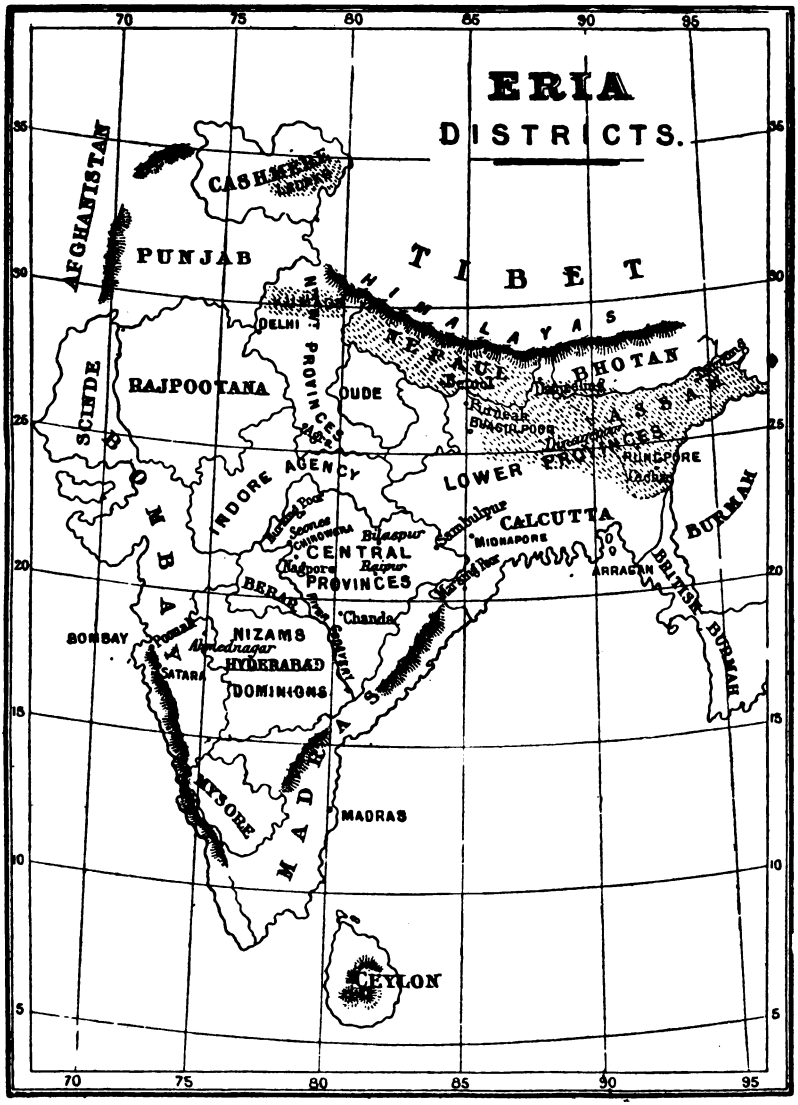
PLATE XXIV.



The shaded parts show the districts in which the Eria moth (*Attacus ricini*) has been found.

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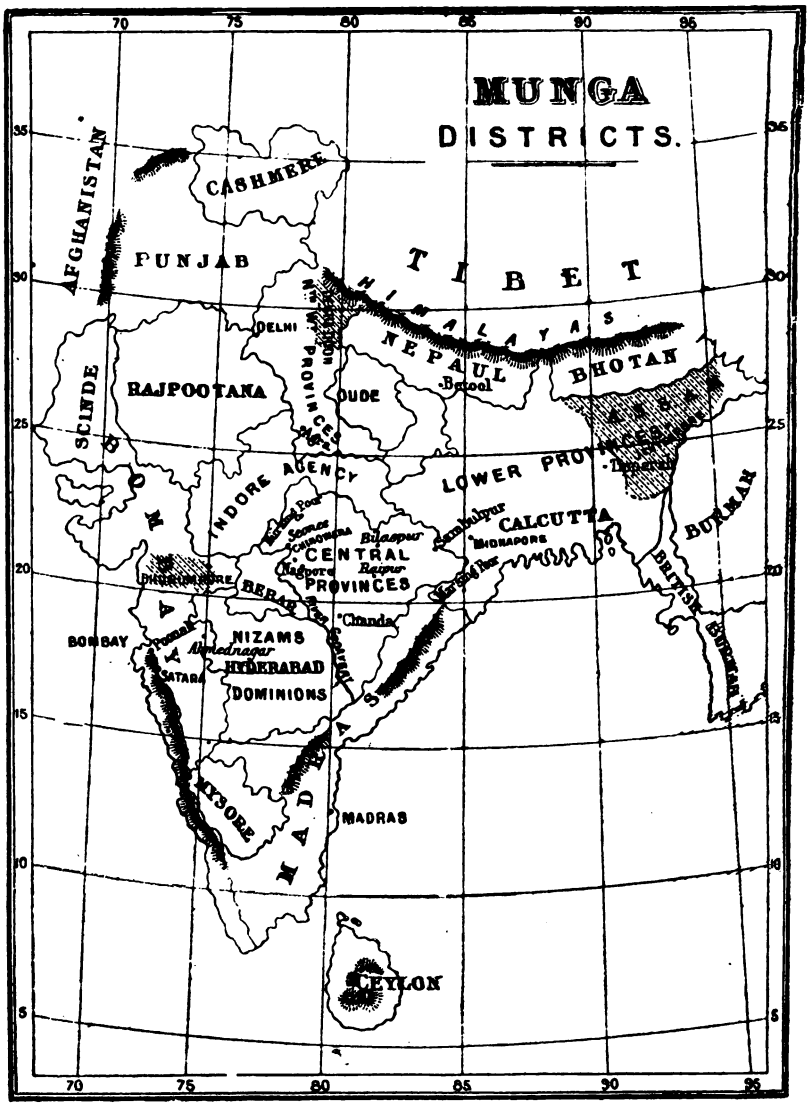
PLATE XXV.



The shaded parts show the districts in which the Munga or Muga moth (*Antheræopsis* or *Antheræa Assama*) has been found.

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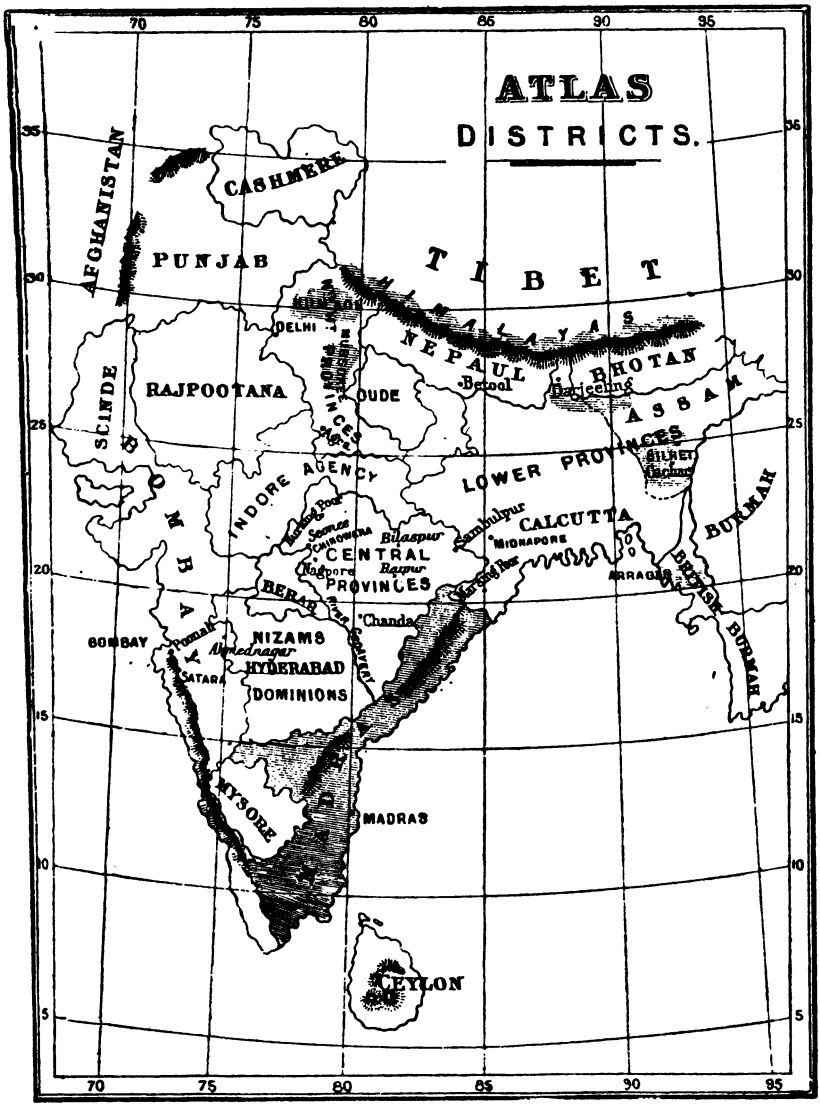

The shaded parts show the districts in which the Atlas moth (*Attacus Atlas*) has been found.

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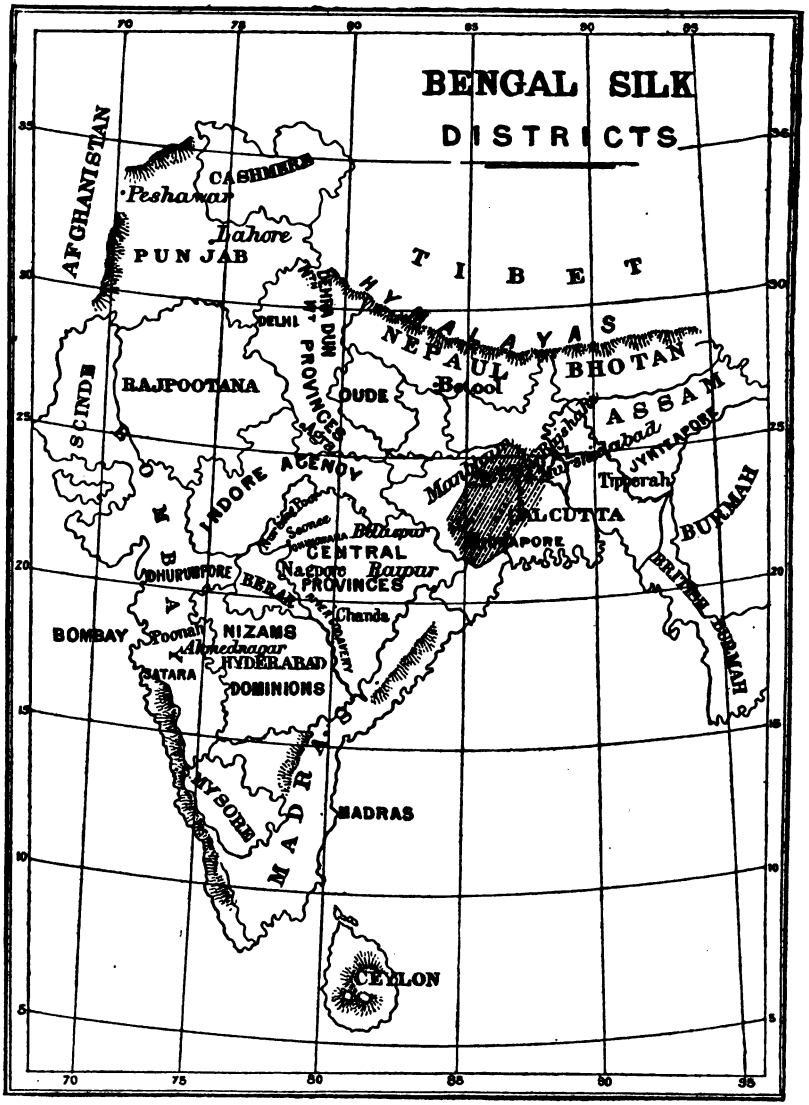
PLATE XXVII.



The shaded portion of Bengal indicates the position of the districts where the silk of the mulberry-feeding silkworm is produced.

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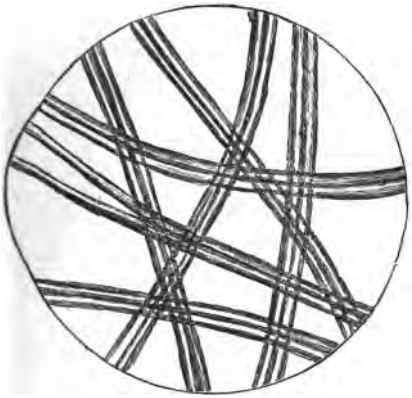
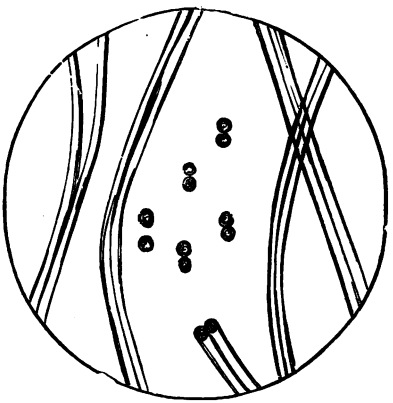
PLATE XXVIII.

FIG. 1.



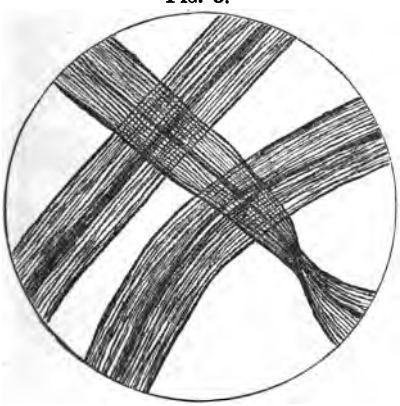
Silk of Bombyx mori, or silk of commerce.

FIG. 2.



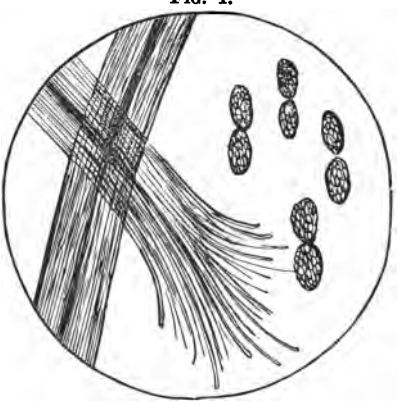
Silk of Bombyx mori, showing transverse sections.

FIG. 3.



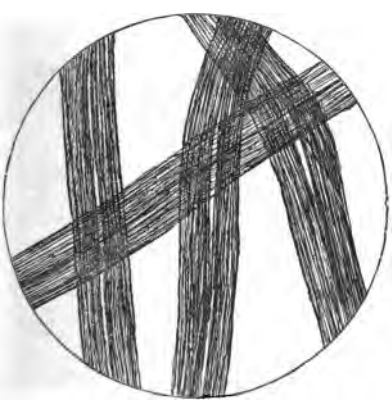
Silk of Antheræa mylitta or Tussur silk.

FIG. 4.



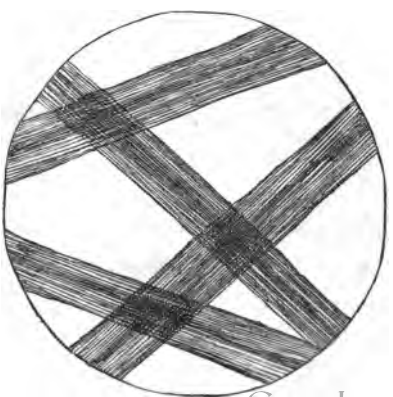
Silk of Antheræa mylitta or Tussur silk, showing fibrets and transverse sections.

FIG. 5.



Silk of Antheræopsis, or Antheræa Assama, or Muga silk.

FIG. 6.



Silk of Antheræopsis or Antheræa pernyi.

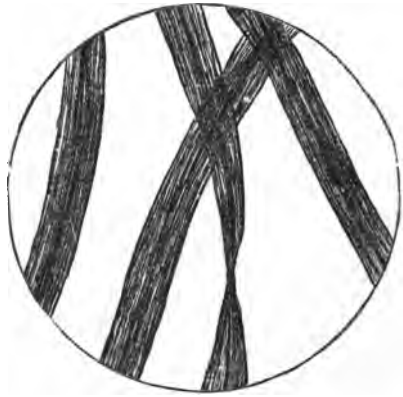
Google

PLATE XXIX.

FIG. 1.

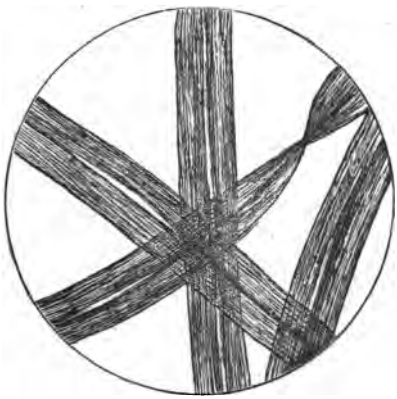
Silk of Actias selene.

FIG. 2.



Silk of Philosamia or Attacus ricini or Eria silk.

FIG. 3.



Silk of Attacus Atlas.

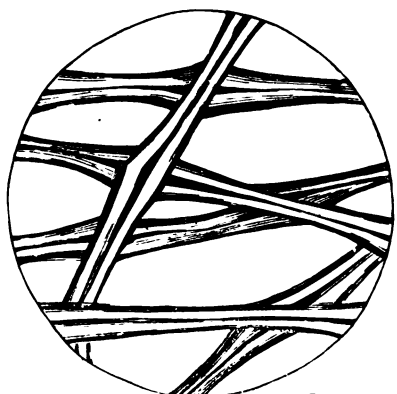
FIG. 4.

Silk of Cricula trifenestrata.

FIG. 5.

Silk of Antheræa yama-mai.

FIG. 6.



Silk of Saturnia carpini.

Google

PLATE XXX.

Terminalia tomentosa (*saj* tree), on the leaves of which the Tussur silkworm feeds.

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PLATE XXXI.

Shorea robusta (*sal* tree), on the leaves of which the Tussur silkworm feeds.

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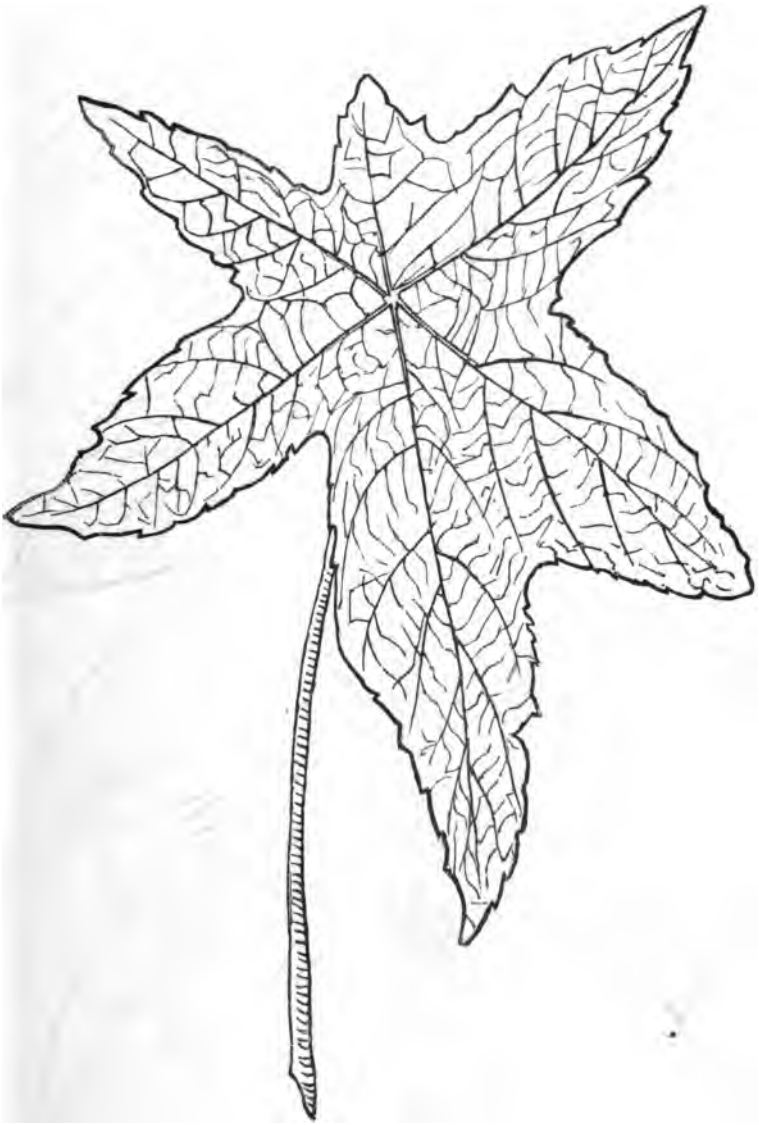

Ricinus communis, on which the Eria silkworm, Philosamia or Attacus ricini, feeds.

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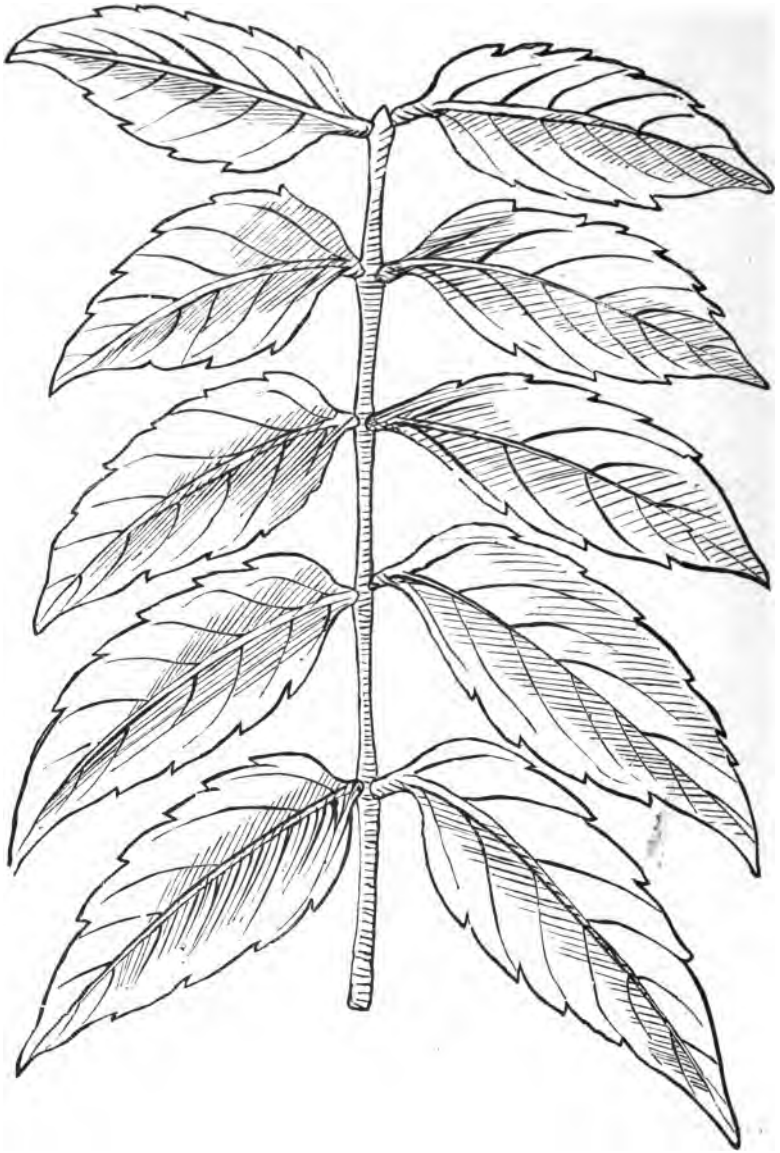
PLATE XXXV.



Ailanthus excelsa, on which the silkworm, Attacus cynthia, feeds.

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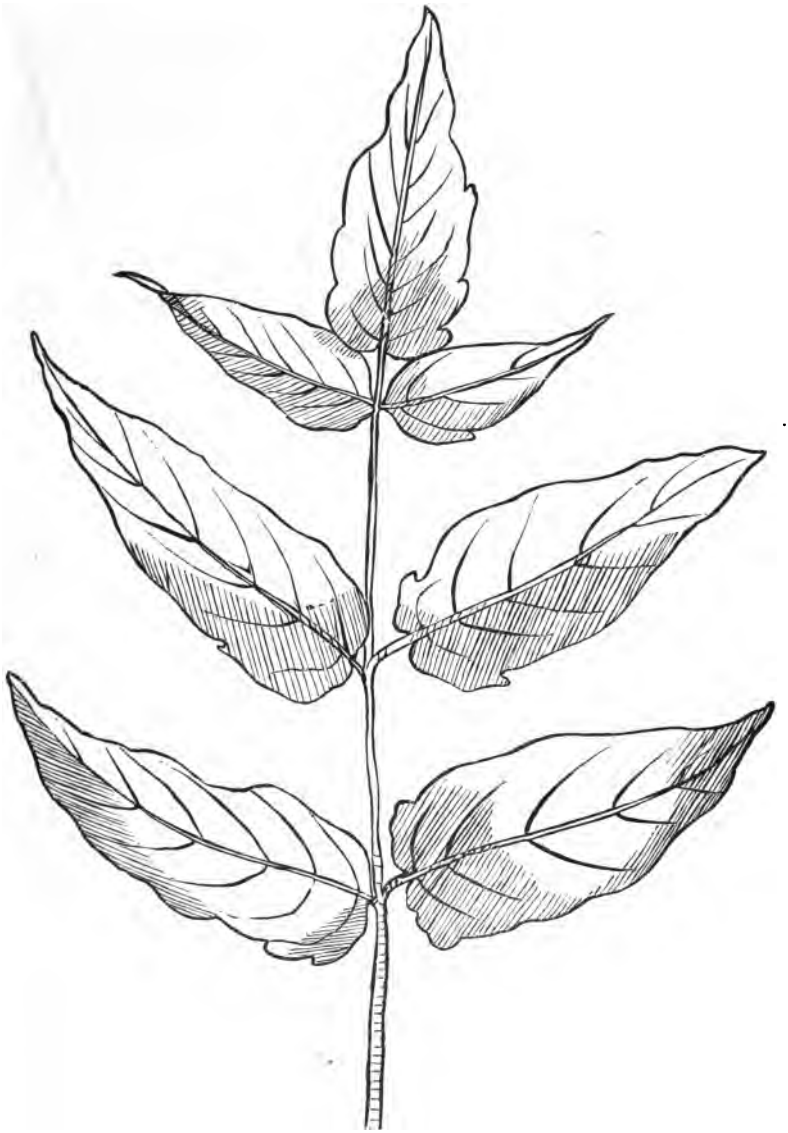

Ailanthus glandulosa, on which the silkworm, Attacus cynthia, feeds.

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PLATE XXXVII.

Morus alba (the Mulberry), on which feeds the silkworm which produces the silk of commerce.

PLATE XXXVIII.

FIG. 1.

Bombyx mori (Male).

FIG. 2.

Antheræa mylitta (Male).

FIG. 3.

Antheræa mylitta (Female).

FIG. 4.

Attacus ricini (Male).

FIG. 5.

Attacus cynthia (Male).

FIG. 6.

Attacus Atlas (Male).

Scales from Wings magnified 140 diameters.

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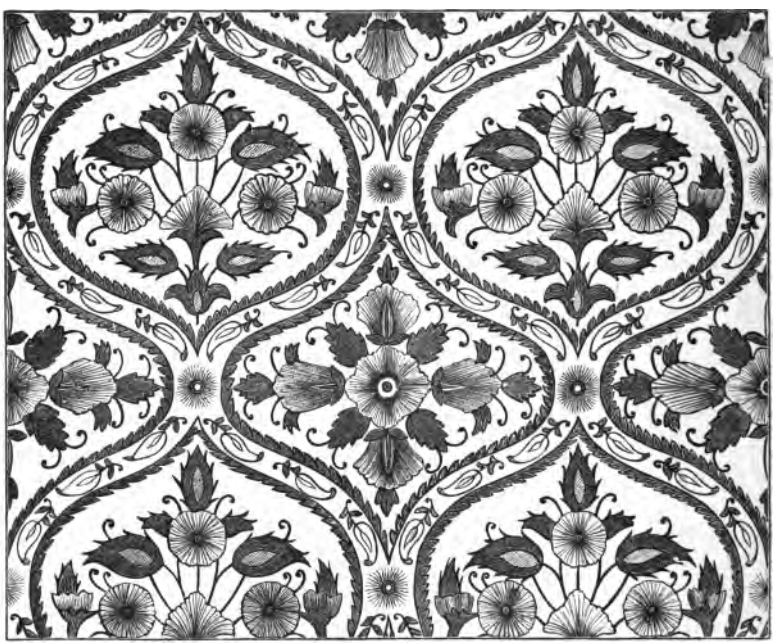

Two examples of "Tussur on Tussur" embroidery by the Leek Embroidery Society, Leek. The designs are Indian, the upper one is a favourite border form of the lotus conventionalised, the lower is an excellent and artistic diaper treatment.

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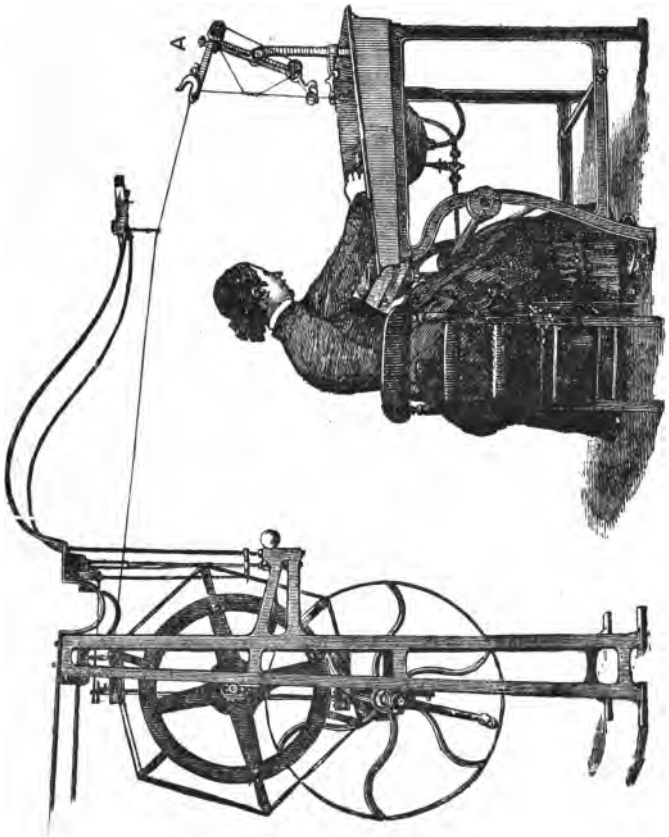
PLATE XL.



European Cocoon-reeling machine, side view. (A. Tavelette Consono.)

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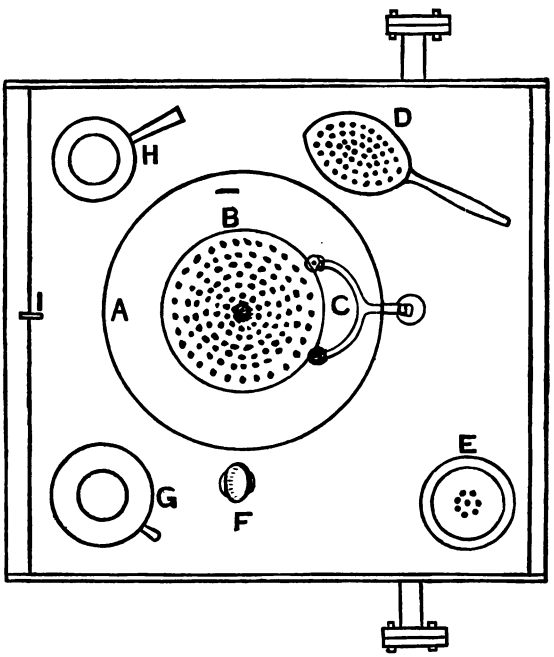
PLATE XLI.



Tray and utensils; mechanical drawing, scale 1 inch to the foot.

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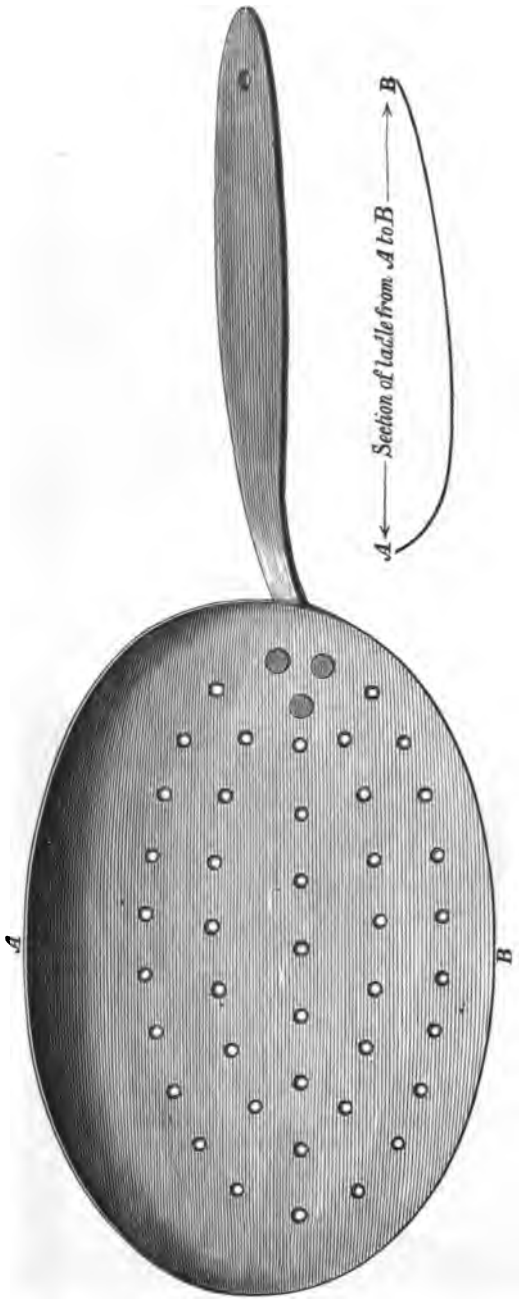
PLATE XLII.



Cocoon ladle for basin; scale ½ of the real size.

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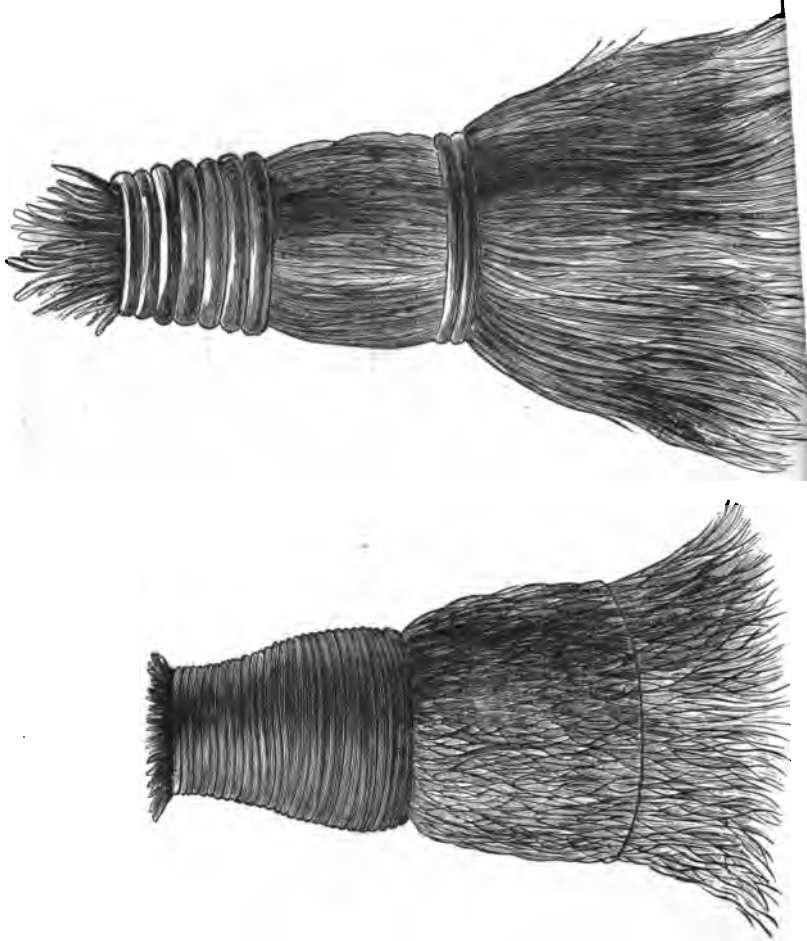
PLATE XLIII.



Brushes for the battage; scale $\frac{1}{2}$ of the real size.
Used for collecting the outer and unreelable Cocoon threads, and for finding the reelable ends.

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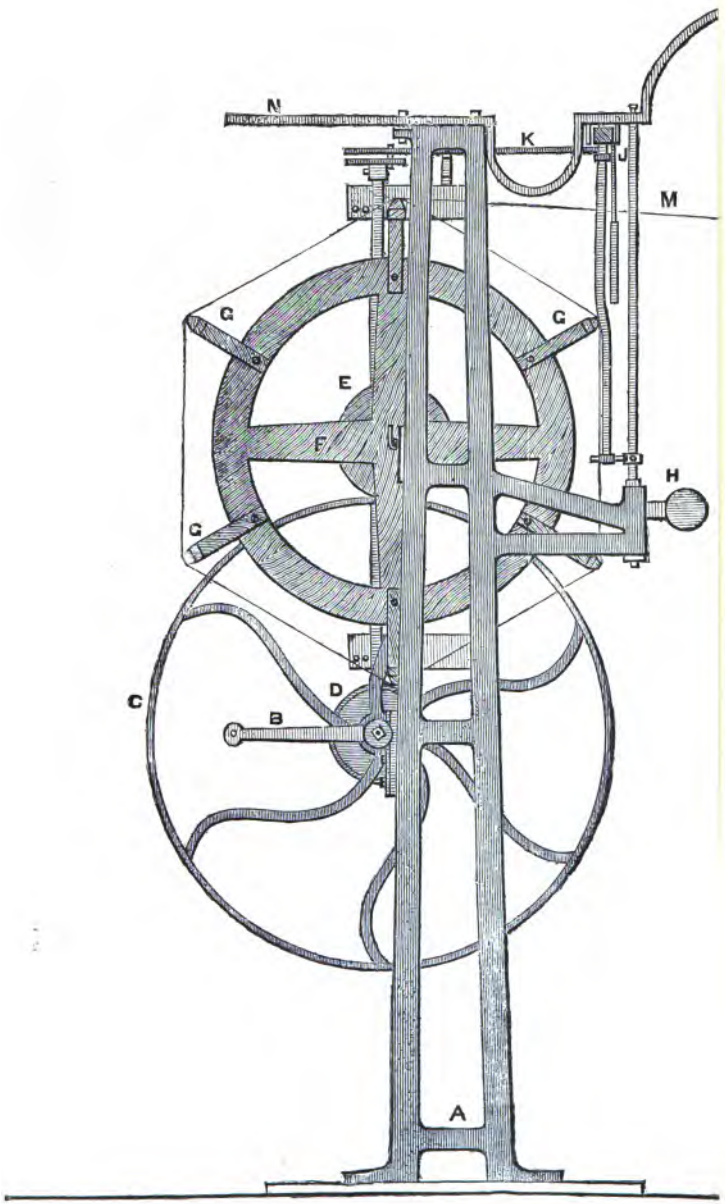

European Cocoon reeling machine, wi

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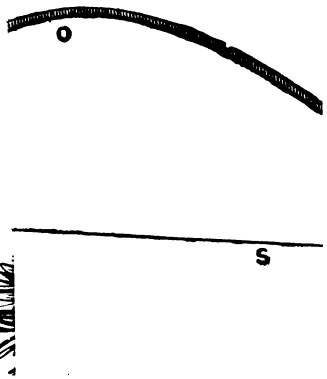
PLATE XLIV.



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